167666.

The Marquis of Stafford.

S.
24-11-06
1661

J. Heath sculp.t A.R.A.

JAMES BARRY ESQ.R late R.A.
& Professor of Painting to the Royal Academy.
From a Picture painted by himself about the Year 1783.

See page 55. of M.r Barry's account of the series of Pictures at the Adelphi,
printed by Edward, London, the same year.

16766

TRANSACTIONS

OF THE

SOCIETY

INSTITUTED AT LONDON,

FOR THE

ENCOURAGEMENT

OF

ARTS, MANUFACTURES, and COMMERCE;

WITH THE

PREMIUMS offered in the Year 1804.

VOL. XXII.

LONDON:

Printed by C. SPILSBURY, Angel-Court, Snowhill.

Sold by the REGISTER, at the SOCIETY'S HOUSE, in the ADELPHI; and by Messrs. ROBSON, J. WHITE, BECKET, JOHNSON, CADELL and DAVIES, ELMSLEY and BREMNER, WALTER, RICHARDSON, DEBRETT, SEWELL, and TAYLOR.

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PREFACE.

AS a just and honourable mark of attention to James Barry, Esq. who planned and completed those excellent and extensive Paintings which decorate the Great Room of the Society, it was voted by them in April last, "That "his portrait should be prefixed as a frontis- "piece to the Twenty-second Volume of their "Transactions, to be engraved in the line man- "ner, and by such artist as he might recom- "mend;"—"That Mr. Barry should be applied "to, to know whether he would choose that the "engraving should be made from his portrait "in the Society's possession, or whether a new "one should be taken of him for that purpose, "or from a model." In consequence of these resolutions, Mr. Barry attended a Committee of the Society appointed for the purpose, and, on his opinion being requested, he stated, "That having in his possession the original "painting from which his portrait exhibited in

" the character of Timanthes, in the painting " of the Victors at Olympia, in the Great " Room, was made, he wished the engraving of " his portrait to be made therefrom, because " it would mark his age and the æra of the " painting, and express the character and energy " of the artist at the time the performance " was undertaken." The Society, in compliance with Mr. Barry's intimation, agreed thereto; and, at his request, the present engraving has been executed by Mr. Heath, under Mr. Barry's direction, and an inscription added, suggested by himself.

The engraving represents Mr. Barry in the character of Timanthes (an excellent painter, recorded by Pliny), sitting on the base of the statue of Hercules, holding in his hand the famous picture of the Cyclops and Satyrs. What we are informed, by the ancients, of the force and expression of the paintings of Timanthes, perfectly accords with the spirited performances of Mr. Barry. The foot of Hercules treading upon the serpent, strongly marks that energy of mind with which Mr. Barry boldly crushes every attempt of malevolence exerted against him, and braves intrepidly the frowns of fortune.

The

The limits of our Preface will not allow us to pursue the spirit and feeling of this great artist; a reference to his works will appreciate his merits better than our words.

In examining the articles which form the subject of the present Volume, it will be found that additional Premiums have been offered in different classes; viz. in the Polite Arts, class 32, *for Designs and Engravings executed by the same artist*, with the intent that the engraving may be executed with the spirit which actuated the original designer; in Mechanicks, class 161, *for an improved Walking Crane to facilitate the loading or unloading of goods*; class 163, *for a Substitute for Elm Pipes now used for conveying water*, in order to prevent the great consumption of wood employed for this purpose; class 163, *for a more effectual method of providing supplies of water in cases of fires*, owing to the mischief which frequently occurs from a want of water at their commencement; class 169, *for improving Turnpike and other Roads*, by a judicious application of natural or artificial compositions for that purpose; class 174, *for raising the Bodies of Persons who have sunk under water*, an object which has been strongly recommended by the Humane

Society, and which was readily adopted to further the views of that laudable institution, the means at present used being frequently insufficient for the purpose. Modifications have also been made in other of the Premiums offered, in order to make them more competent for the end designed, as the Society are ever desirous to encourage useful objects, or adopt alterations more conducive to their effect.

In the compilation of the present Volume, the Public will observe, that the Society have been anxious to give useful information, rather than an extent of paper or words, and that with this view the List of Premiums, and various other parts of the Volume, are printed with a smaller type, the letters set closer together, and useless certificates abridged.

To encourage Artists in different lines, some engravings are furnished from wood, and others from copper; and the Society have endeavoured to explain, by the letter-press and engravings, every improvement, so as to render it intelligible to any person who is interested in the subject.

Under the head of *Agriculture*, it will be found that John Christian Curwen, Esq. has set a meritorious example to the Public, by his judicious

judicious and extensive plantations, by very useful remarks on the subject of draining, to prevent the world being misled by popular opinions, and by the introduction of a machine easily worked, which answers the double purpose of preparing food for cattle from potatoes, and of washing family linen, with less damage and more facility than other machines which have heretofore been employed for that purpose.

The active duty of a magistrate, in which Mr. Borron is engaged in a populous county, has not prevented his attention to other useful objects; his Paper on Plantations of Osiers contains concise but judicious information on their cultivation to advantage.

Mr. Plowman's Sheepfold bids fair to be a valuable acquisition to the public, being much more easily moveable than those in common use, and requires less frequently to be repaired; it also effectually secures both sheep and hogs from depredations.

In Mr. Hutton's plantations of Forest Trees, amongst other useful observations, *one* cannot be too much enforced; viz. that in exposed situations it is advisable to plant with considerably smaller trees, and at narrower intervals,

than in places screened from the winds. Many plantations have been destroyed for want of attention to this necessary point.

The plain and simple narrative of William Pearce, speaks with greater energy to the heart, than the most studied and eloquent oration; it is not a repetition of thoughts and opinions, but a clear detail of well-authenticated facts; it tacitly reflects upon those persons who lead a life of indolence, by contrasting it with the great powers implanted in man by the all-wise Creator, and the general advantage arising to individuals and the public by the proper use of such powers. The Society have brought this man from obscurity to public view, as an example of what can be done under material personal disadvantages; and it would afford an interesting employment for the mind, to calculate in how short a period the waste lands of this united empire might acquire a complete state of culture, if men equally capable would be equally industrious.

The construction of Mr. Waistell's Field Gate unites strength, elegance, and lightness; it does not require so much timber as the common gates, and shorter wood will answer to make it; it reflects great credit upon Mr. Waistell

Waistell for his minute and clear detail upon the subject, and for having pointed out the means of saving an immense quantity of valuable timber annually employed for this purpose.

Although the experiments made by Mr. Watson on the comparative Culture of Turnips drilled and broadcast, were not carried on upon the extensive scale required by the Society in the list of premiums offered ; yet this communication will be found to contain many important observations ; and the method of sowing the turnip-seed in drills, and well covering the manure in the manner he has clearly explained, demands particular attention.

Mr. Shirreff's method of Housing Turnips, contains a full account of the mode he has successfully practised to preserve them during the winter months : the principle is not perfectly new ; but we do not recollect any publication where it is related with such accuracy, or the advantages of the subsequent crops so well explained.

The preservation of that excellent root, the Potatoe, for a length of time in a state fit for vegetation, is certainly a desirable object ; the information furnished by Mr. I. De Lancy, towards the attainment thereof, indicates that it may

may be accomplished, and, it is hoped, will conduce to prevent the great waste of this vegetable, too frequently made for want of care and attention.

Under the article *Chemistry*, the invention of a Madder Lake, or a red precipitate, from madder, by Sir H. Englefield, Bart. offers, agreeably to the suffrages of many artists of great repute, an estimable and permanent colour, whether mixed with oil or water. Those persons who have noticed the faded tints in the works of that great artist, Sir Joshua Reynolds, will lament that this Madder Lake was not known at an earlier period.

The account of a discovery of a Mine of Manganese, in Scotland, for which the public are indebted to Dr. Dyce, is accompanied with some excellent observations by him upon the subject, and an ingenious process of separating the pure from the base metals, by means of Manganese. It may be necessary to add, that immense quantities of Manganese are employed in the preparation of the oxygenated muriatic acid, for the purpose of bleaching linen and cotton.

Mr. Matthew Gregson, of Liverpool, has been indefatigable in attempting to alleviate pecuniary

cuniary losses occasioned by fire, for which purpose he has applied the burnt coal or residuum, after fires, of sugar, grain, and other articles, to various uses, such as paints, glutens, or varnishes, with great success, and with a disinterested spirit, which does him great honour. An impression in the Volume, from an engraving on wood, cut at his own expense, and printed with black produced from burnt corn, will show that this article will form a useful printing ink.

The present scarcity of oak bark, and the too frequent mischief arising to oak timber, from its destruction for the bark, induced the Society, a few years past, to offer a premium for a substitute to answer the same purpose, in tanning leather. The communication of Dr. Howison, and the Preparations he has made from Foreign Barks, to answer equally well in tanning, have opened a valuable source of emolument from our foreign colonies. To the same gentleman the public are indebted for his discovery of a Process for printing a permanent topical Black on Cotton, without a mixture of iron in the composition.

Mr. Machlachlan, of Calcutta, has, by his communication of two Processes for producing the beautiful and permanent Red Colours, dyed

on

on the coast of Coromandel, afforded hints for improving our manufactures, and has shown that large quantities of Talc may be procured from India at a moderate expense; an article which we know may be used with great profit and advantage in England.

Under the head of *Polite Arts*, an ingenious mode will be found, communicated by Mr. Churchman, of improving the Engravings of Maps or Plans, pointing out, on a simple inspection, the altitudes of mountains, or depths of waters, and the particular parts where the rises or falls are most steep, or most easy to be passed.

The rewards lately bestowed to young persons in the class of Polite Arts, are particularly enumerated at page 424 of the present Volume, we shall therefore only remark, that to generous and feeling minds, words would add feeble testimonies of the gratification they would experience by attending the annual distribution of the premiums of the Society, of viewing the merits of the young candidates of both sexes, and observing the smiles of pleasure which animate the countenances of their friends, on witnessing the rewards conferred on rising genius.

Under

Under the class of *Manufactures* will be found accounts of two improved Looms for weaving similar articles; the one a Swivel Loom, by Mr. James Birch; the other an Engine Loom, by Mr. Thomas Pickard. It is impossible to describe, verbally, the particular constructions of either of them; the Society have therefore preserved complete models of each in their repository, and, on proper applications, will refer such persons as they approve, to see the original looms actually at work.

The class of *Mechanicks* contains a great variety of information in different branches of that department.

The Dam executed by the Rev. Daniel Pape, points out a means, by a speedy and well-concerted plan, and at an easy expense, not only to turn the channel of a river into a new course, but, in cases of breaches in sea-banks, by an early application of articles easily procured, to prevent the dangers which frequently happen from delay.

Captain Brodie, of the Royal Navy, has shown an active and intelligent mind in pointing out a mode by which Light-Houses may be constructed firmly on sunken rocks at present dangerous to navigators, and invented a plan by which

which many of our harbours may be rendered much more secure. He has also suggested several other hints, useful in naval concerns.

The baneful effects which the workmen experience who are employed in grinding Painters Colours, have engaged the attention of many celebrated physicians ; and any mean that would tend to lessen the evil, has been considered as a desideratum. A trial for a length of time, by Mr. Rawlinson, of his mill for grinding painters colours, and respectable references to the Society, of its merits, evince that it will contribute to prevent the mischief.

The Society regard, with peculiar satisfaction, every invention which gives a facility to our Naval exertions; and we have no doubt that the method proposed by Mr. Seppings, of obviating the necessity of lifting Ships, and which has been lately successfully introduced into most of his Majesty's dock-yards, will prove also very serviceable in the private dock-yards of the united empire.

From the general use of Fire-arms, and the accidents which frequently occur from faults in their construction, the Society has been induced to reward Mr. Dodd for a Lock of his invention, which not only possesses the strength and simplicity

simplicity of those commonly known, but is infinitely more secure upon the half-cock.

Workmen employed in the Shoe-making branch, have ever been subject to very painful internal diseases, from being obliged, in the common way, to do their whole work in a bent posture: an invention by Mr. Thomas Holden, which enables the shoemaker to execute a great part of the work in a standing position, has obviated the inconveniencies complained of, and restored several invalids in that business to perfect health.

The accuracy of Time-keepers has long been regarded as a very necessary object to navigators, by enabling them to calculate the ship's way with greater accuracy, and to avoid the dangers which occur in a voyage. The simplicity and advantage of Mr. William Hardy's invention of banking the balance of a Time-keeper, will appear by inspection.

Probably no business has contributed so much to the general advantage of the extensive manufactures of this country, as that of Watch-making, by furnishing hints which have been applied to use in our cotton-factories, steam-engines, &c. The make and sale of watches alone is carried to an extent which will scarcely

scarcely admit of calculation; and every improvement in their construction assists greatly in promoting the demand for exportation. Mr. Elliot's improved Repeating Watch, whether considered as an article for home use or for exportation, will be found to possess great merit, and save a considerable annual sum to the purchaser.

Repeated accidents have occurred to the boilers of steam-engines, owing to the safety-valves being frequently improperly constructed, and from employing two in the same boiler. The improved Double Valve, invented by the Chevalier Edelcrantz, appears at once to be simple and effectual in its use.

Mr. Walby's Forge-Hammer, worked by the muscular power of the hands and feet, assisted by the weight of the body, shows a very ingenious and powerful mode of human exertion; its action is quick, accurate, and capable of any modification; it bids fair to be a very valuable instrument to those workers in iron, who have not money sufficient to purchase, or ample employment for a steam-engine; and it may be worked by one, two, three, or four men, as the nature of the work may require. From its

quick

quick dispatch, the metal it works will not have occasion to be so often heated, and therefore preserves a better temper. Such persons as will examine it at Mr. Walby's house, when actually at work, will be highly gratified by the inspection.

Under the class of Colonies and Trade, it will give great pleasure to the well-wishers of the United Empire, to see the endeavours of the Society succeed in an object of so much importance as the establishment of the culture of Hemp in our colonies.

Every man is sensible of the necessity of providing supplies of this article for our ships, our navy being the bulwark of this kingdom, and the terror of its enemies.

The Society have endeavoured to draw into one point of view the articles which serve for the purpose of cordage in every part of the world, and have not formed their opinion on theory, but on actual experiments, many of which are found detailed in the present Volume, as further noticed.

In our last Preface we expressed our wishes, that government would well consider the propriety of encouraging the culture of hemp in Canada, and its purchase from thence, on fair

terms, with ready money, and by proper agents; the Society have proved it may be done, and shown by what means success may be ensured. We cannot too much enforce to public consideration this important object, as we do not find that any means have yet been adopted by Government to purchase what has been already grown in Canada. It is well known that the growers of hemp there have not capitals to give credit upon, nor are the cultivators merchants.

Isaac Winslow Clarke, Esq. of Montreal, has exported from thence to London, upwards of 2500lb. of hemp. The experiments of Messrs. Bich prove that its strength is even more than what is required by Government for making ropes; and the experiments of Messrs. Fowlers show, that if properly prepared, there is no doubt it will be equal, if not superior, to the best assortments of Russia hemp, for twines, &c. Messrs. Schneider and Mosher have given ample accounts of the expenses attending the cultivation of hemp in Canada. Mr. Allan's letter observes, that there is every probability that the culture of hemp for exportation from Canada will eventually have the desired effect; and the more support it receives in its infancy, the sooner this will be accomplished.

The

The experiments made by Dr. Roxburgh, of Calcutta, to ascertain the comparative strength of Hemp and other vegetable fibres, the growth of the East Indies, do great credit to the genius of this excellent naturalist, to whom the public are so much indebted for many other valuable communications from India: we hope his exertions will be continued in this useful branch of knowledge.

Dr. Anderson's communication relative to the Botanic Garden of St. Vincent, confirms the information noticed in our twenty-first volume, of additions having been made to the Royal Botanical Garden there, of some valuable land, and the advantages likely to result from it.

From the public spirit shown by Mr. Walter Baine, in the British Herring Fishery, there appears great reason to suppose that very considerable improvements are making by him in this valuable branch of commerce; the Society, anxious to open to the public this source of wealth, have not only continued their bounty, but added to the Volume some valuable information, likely to contribute to this purpose, by communicating the best processes employed by the Hollanders, in the preparation of the fish, when caught.

The Rewards conferred by the Society this session, will be found particularly detailed under that head, at page 419; and the Presents which have been received from public bodies, and individuals, are fully noticed at page 430. During the late recess of the Society, additional room has been made in the Library; and whilst the Society express their thanks for the presents of books received during the last year, they look forward with hope to a farther increase in a line of knowledge so consistent with their views.

The Society desire it to be clearly understood, that, as a body, they are not responsible for any opinion or representation of the facts contained in the following pages. They have allowed the communications to pass in the language and manner of the several persons mentioned, without attempting to make embellishments in the style, to the prejudice of the subject-matter.

The present session commenced in October last, and will continue till the first Wednesday in June, 1805. The Distribution of the Rewards of the Society will take place on Tuesday, the 28th of May. The Anniversary Dinner of the Society is usually at the latter end of March,

March, or beginning of April. Previous notice will be given thereof in the public papers.

The funds of the Society are in a very flourishing state; and although it might be supposed that the troubles of war would damp the ardour of private persons in encouraging public establishments, yet with pleasure we announce that upwards of one hundred members were added the last session to the list of the Society: it should, however, be generally understood, that the views of the Society are extensive and important, and that whatever sums arise above the common incidental expenses of the Establishment, revert, without deduction, to the public; therefore afford proportionably a much more extensive promotion of the arts and commerce of this empire.

The number of rewards given during the last session exceed those of any preceding year, and show the extensive influence of the Society.

To every branch of Arts, Manufactures, and Commerce, by which the happiness of mankind can be promoted, the Society afford encouragement; and they invite the communications of men of abilities on the subjects conducive to such purposes.

The

The public may be assured, that any useful information, addressed to Mr. Charles Taylor, the Secretary of the Society, will be immediately laid before them, and considered. A reference to the rewards annually given by the Society, will show, that their bounties are not confined within the lists of the premiums they offer, they are ever anxious to discover and reward real genius.

An æra of 50 years has been now completed since the institution of this Society: as far as human judgment can foretell future events, there is every reason to expect that the Society established for the Encouragement of Arts, Manufactures, and Commerce, will remain great and flourishing to many succeeding ages, will reflect an honour upon the merit and judgment of its founders, will preserve its reputation unsullied, and its character highly respected throughout every part of the known world.

John-street, Adelphi,
London, Dec. 24, 1804.

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Additional Premium in Mechanicks.

PREMIUM offered for preventing prejudicial effects to the persons employed in POINTING NEEDLES.

To the person who shall invent, and produce to the Society, a Mode of obviating the prejudicial effects that attend the operation of pointing Needles, by grinding them dry, during which the particles of grindstone dust, and steel, being thrown into the air, and received with it into the lungs, occasion asthma, consumption, and other painful disorders. The GOLD MEDAL, or THIRTY GUINEAS.

A MODEL of the Apparatus, and a full Account of the means by which the effect has been produced, together with proper CERTIFICATES of its practicability and adoption, to be delivered to the Society on or before the second Tuesday in March, 1805.

PREMIUMS offered by the SOCIETY, *instituted at* London, *for the Encouragement of Arts, Manufactures, and Commerce, for the Year* 1804.

TO THE PUBLIC.

THE chief objects of the SOCIETY are to promote the Arts, Manufactures, and Commerce of this kingdom, by giving rewards for all such useful Inventions, Discoveries, and Improvements, (though not mentioned in this book), as tend to that purpose; and, in pursuance of this plan, the SOCIETY have already expended FIFTY THOUSAND POUNDS, advanced by voluntary subscriptions of their members, and legacies bequeathed.

The manner in which this money has been distributed may be seen by applying to the Secretary or other officers of the SOCIETY, at their house in the *Adelphi*. The Register of the Premiums and Bounties they have given will show the very great advantages which the Public have derived from this Institution.

The meetings of the SOCIETY are held every *Wednesday*, at seven o'clock in the evening, from the fourth *Wednesday* in *October* to the first *Wednesday* in *June*. The several Committees meet on other evenings in the week during the session.

In order still farther to promote the laudable views of this SOCIETY, it may be necessary to explain the mode by which its members continue to be elected.

Each member has the privilege, at any weekly meeting of the SOCIETY, of proposing any person who is desirous to become a member, provided such proposal is signed by three members of the SOCIETY.

Peers of the Realm or Lords of Parliament are, on their being proposed, immediately balloted for; and the name, with the addition and place of abode, of every other person proposing to become a member, is to be delivered to the Secretary, who is to read the same, and properly insert the name in a list, which is to be hung up in the SOCIETY's room until the next meeting; at which time such person shall be balloted for; and, if two-thirds of the members, then voting, ballot in his favour, he shall be deemed a *perpetual member*, upon payment of *Twenty Guineas* at one payment; or a *subscribing member*, upon payment of any sum not less than *Two Guineas* annually.

Every member is entitled to vote and be concerned in all the transactions of the SOCIETY, and to attend and vote at the several Committees. He has also the privilege of recommending two persons as Auditors, at the weekly meeting of the SOCIETY; and, by addressing a note to the Housekeeper, of introducing his friends to examine the various models, machines, and productions, in different branches of arts, manufactures, and commerce, for which rewards have been bestowed; and to inspect the magnificent series of moral and historical paintings, so happily contrived and completed by JAMES BARRY, Esq. which, with some valuable busts and statues, decorate the Great Room. He has likewise the use of a valuable Library; and is entitled to the annual Volume of the SOCIETY's Transactions.

The time appointed for admission to the paintings or models, is from ten to two o'clock, *Sundays* and *Wednesdays* excepted.

PREMIUMS IN AGRICULTURE.

Class 1. ACORNS.

FOR having set, between the first of October, 1802, and the first of April, 1803, the greatest quantity of land, not less than ten acres, with acorns, with or without seeds, cuttings, or plants of other trees, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

2. For the second greatest quantity of land, not less than five acres, set agreeably to the above conditions, the silver medal.

Certificates of setting agreeably to the above conditions, and that there are not fewer than three hundred young oaks on each acre, to be delivered to the Society on or before the first Tuesday in December, 1804.

3. RAISING OAKS. To the person who shall have raised, since the year 1800, the greatest number of oaks, not fewer than five thousand, either from young plants or acorns, in order to secure a succession of oak timber in this kingdom; the gold medal.

4. For the next greatest number, not fewer than three thousand; the silver medal.

Certificates that there were on the land, at least the number of young oak-trees required, in a thriving condition, two years after the planting, with an *account* of the methods pursued in making and managing the plantation,

to be produced to the Society on or before the first Tuesday in January, 1805.

5. Ascertaining the best Method of raising Oaks. To the person who shall ascertain in the best manner, by actual experiments, the comparative merits of the different modes of raising oaks for timber, either from acorns set on land properly dug or tilled, from acorns set by the spade or dibble, without digging or tillage, either on a smooth surface, or among bushes, fern, or other cover; or from young plants previously raised in nurseries, and transplanted; regard being had to the expense, growth, and other respective advantages of the several methods; the gold medal.

The *accounts*, and proper *certificates* that not less than one acre has been cultivated in each mode, to be produced to the Society on or before the first Tuesday in November, 1804.

6. Chesnuts. For having sown or set, between the first of October, 1802, and the first of April, 1803, the greatest quantity of dry loamy land, not less than six acres, with Spanish chesnuts, with or without seeds, cuttings, or plants of other trees, adapted to such soil, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

7. For the second greatest quantity, not less than four acres, the silver medal.

Certificates of sowing or setting, agreeably to the above conditions, and that there are not fewer than three hundred chesnut plants, in a thriving state, on each acre, to be delivered to the Society on or before the first Tuesday in January, 1805.

8. Elm. For having planted the greatest number of the English elm, not less than eight thousand, between the twenty-fourth of June, 1802, and the twenty-fourth of June, 1803; and for having effectually fenced and preserved the same, in order to raise timber; the gold medal.

9. For the second greatest number, not less than five thousand, the silver medal.

Certificates of having planted, agreeably to the above conditions, that the plants were in a healthy and thriving state two years at least after making the plantation, and specifying the distance of the plants, to be delivered to the Society on or before the first Tuesday in April, 1805.

10. Larch. For having planted out, between the twenty-fourth of June 1801, and the twenty-fourth of June, 1802, the greatest number of larch-trees, not fewer than five thousand; and for having effectually fenced and preserved the same, in order to raise timber; the gold medal.

11. For the next greatest number, not fewer than three thousand, the silver medal.

Certificates of the number of plants, that they were in a healthy and thriving state two years at least after they were planted out, with a general account of the methods used in making the plantation, to be delivered to the Society on or before the last Tuesday in December, 1804.

12, 13. The same premiums are extended one year farther.

Certificates to be produced on or before the last Tuesday in December, 1805.

N. B. The larch-trees may be either planted, mixed with other trees, or by themselves, as may best suit the convenience of the planter.

14. Osiers. To the person who shall have planted, between the first of October, 1803, and the first of May, 1804, the greatest quantity of land, not less than five acres, with those kinds of willows, commonly known by the names of osier, Spaniard, new kind, or French, fit for the purpose of basket-makers, not fewer than twelve thousand plants on each acre; the gold medal, or thirty guineas.

15. For the second greatest quantity of land, not less than three acres, the silver medal, or ten guineas. *Certificates* of the planting, and that the plants were in a thriving state five months at least after the planting, to be produced to the Society on or before the last Tuesday in November, 1804.

16. Alder. For having planted, in the year 1801, the greatest number of alders, not less than three thousand; the gold medal.

Certificates of the number of plants, and that they were in a thriving state two years at least after being planted, to be delivered to the Society on or before the last Tuesday in December, 1804.

17. Ash. For having sown or set, in the year 1801, the greatest quantity of land, not less than six acres, with ash for timber, with or without seeds, cuttings, or plants, of such other trees as are adapted to the soil; the gold medal.

18. For the next greatest quantity, not less than four acres, the silver medal.

Certificates of the sowing or setting, agreeably to the above conditions, that there are not fewer than one hundred ash plants on each acre, in a thriving and healthy condition, two years at least after the sowing or setting, with a general account of the methods used in making the plantation; to be delivered to the Society on or before the last Tuesday in December, 1804.

19, 20. The same premiums are extended one year farther.

Certificates to be delivered on or before the last Tuesday in December, 1805.

N. B. It is the particular wish of the Society, that such lands only as are not calculated for growing corn, should be employed for the purposes specified in these advertisements.

21. Forest-trees. To the person who shall have inclosed and planted, or set, the greatest number of acres (not less than ten) of land, that is incapable of being ploughed, such as the borders of rivers, the sides of precipices, and any land that has too many rocks, or that is not calculated to repay the expense of tillage, owing to the stiffness or poverty of the soil, the surface being too hilly, mountainous, or otherwise unfit for tillage, with the best sorts of forest-trees, namely, oak, Spanish chesnuts, ash, elm, beech, alder, willow, larch, spruce and silver fir, with or without screens of Scotch fir, adapted to the soil, and intended for timber-trees, between the first of October, 1801, and the first of April, 1802; the gold medal.

22. For the second greatest quantity of land, not less than seven acres; the silver medal, or ten guineas.

23. For the third greatest quantity of land, not less than five acres, the silver medal. A particular *account* of the methods used in making and managing the plantations, the nature of the soil, the probable number of each sort of plants, together with proper *certificates* that they were in a healthy and thriving state two years at least after making the plantation, to be delivered to the Society on or before the first Tuesday in November, 1804.

24, 25, 26. The same premiums are extended one year farther. *Certificates* to be produced on or before the first Tuesday in November, 1805.

N. B. With the above forest-trees, the seeds, cuttings, or plants, of such other trees as are adapted to the soil, and proper for underwood, may or may not be intermixed.

N. B. *The candidates for planting all kinds of trees are to produce certificates that the respective plantations are properly fenced and secured, and particularly to state the condition of the plants at the time of signing such certificates. Any information which the candidates for the foregoing premiums may choose to communicate, relative to the methods made use of in forming the plantations, or promoting the growth of the several trees, or any other observations that may have occurred on the subject, will be thankfully received,*

27. Securing Plantations of Timber-trees, and Hedge-rows. To the person who shall give to the Society the most satisfactory account, founded on experience, of the most effectual and least expensive method of securing young plantations of timber-trees, and hedge-rows, from hares and rabbits, as well as sheep and larger cattle, which at the same time shall be least subject to the depredations of wood-stealers, the silver medal, or ten guineas. The *accounts*, and *certificates* of the efficacy of the method, to be produced to the Society on or before the first Tuesday in November, 1804.

28. The same premium is extended one year farther. The *accounts* and *certificates* to be produced on or before the first Tuesday in November, 1805.

29. Comparative Tillage. For the most satisfactory set of experiments, made on not less than eight acres of land, four of which to be trench-ploughed,* and four to be ploughed in the usual manner, in order to ascertain in what cases it may be advisable to shorten the operations of tillage, by adopting one trench-ploughing, for the purpose of burying the weeds, instead of the method, now in common use, of ploughing and harrowing the land three or four times, and raking the weeds together and burning them; the gold medal. It is required that every operation and expense attending each mode of culture be fully and accurately described, and that proper *certificates* of the nature and condition of the land on which the experiments are made, together with a circumstantial account of the appearance of the subsequent crops during their growth; and also of the quantity and weight of the corn and straw under each mode of culture, or, in case of a green crop, the weight of an average sixteen perches, be produced to the Society on or before the first Tuesday in February, 1805.

30. Comparative Culture of Wheat, broad-cast, drilled, and dibbled. For the best set of experiments, made on not less than twelve acres, four of which to be sown broad-cast, four drilled, and four dibbled, the two latter in equidistant rows, in order fully to ascertain which is the most advantageous mode of cultivating wheat; the gold medal, or thirty guineas. It is required that every operation and expense of each mode of culture be fully described; and that proper *certificates* of the nature and condition of the land on which the experiments are made, together with an *account* of the produce of the corn, the weight per bushel, and also of the straw, be produced to the Society on or before the first Tuesday in February, 1805.

31. Spring Wheat. To the person who, between the 10th of January and the 10th of April, 1804, shall cultivate the greatest quantity of wheat, not less than ten acres; the gold medal. It is required, that the time of sowing and reaping be noticed; also a particular *account* of the species, cultivation, and expense attending it, with proper *certificates* of the nature and condition of the land on which the experiments were made, and the name of the crop, if any, which the same land bore the preceding

* It is a common practice among gardeners, when they have a piece of very foul land, to dig it two spits, or about eighteen inches deep, shovelling the weeds to the bottom. This they call trenching.

year; together with an *account* of the produce, the weight per Winchester bushel; and a sample, not less than a quart, be produced to the Society on or before the second Tuesday in February, 1805.

It is supposed that sowing wheat early in the spring will not only allow more time to till the land, but less for the growth of weeds; thus rendering the wheat as clean as a barley crop, and exhausting the soil much less than autumnal sowing. It may be seen in the 19th volume, that the wheat usually sown in autumn may be put into the ground, with great success, so late as February or March, thus giving time to clear the ground from turnips, or to avoid a bad season.

32. Beans and Wheat. To the person who shall have dibbled or drilled, between the 1st of December, 1803, and the 1st of April, 1804, the greatest quantity of land, not less than ten acres, with beans, in equidistant rows, and hoed the intervals twice or oftener, and shall have sown the same land with wheat in the autumn of the year 1804; the gold medal. It is required that an *account* of the sort and quantity of beans, the time of dibbling or drilling, and of reaping or mowing them, the produce per acre thrashed, the expense of dibbling or drilling, hand or horse hoeing, the distance of the rows, and the quality of the soil, together with *certificates* of the number of acres, and that the land was afterwards actually sown with wheat, be produced on or before the second Tuesday in March, 1805.

33. Beans. To the person who, in the year 1803, shall discover and cultivate, either by the drill or dibbling method, on not less than five acres, a species of horse-beans or tick-beans, that will ripen their seeds before the 21st of August; the silver medal, or ten guineas. It is required that a particular account of the bean, the cultivation, and the expense attending it, with proper *certificates* of the nature and condition of the land on which the experiments are made, together with an *account* of the produce, the weight per Winchester bushel, and a sample of not less than a quart, be produced to the Society on or before the first Tuesday in December, 1804. It is apprehended that, if a bean should be brought into cultivation with the habits of the hotspur, or other early peas, that it would, in a great measure, escape the danger arising from the collier-insect, or other insects, and allow more time for the farmers to till the land for the subsequent crop of wheat. The *accounts* and *certificates* to be delivered on or before the first Tuesday in December, 1804.

34. The same premium is extended one year farther. The *accounts* and *certificates* to be delivered on or before the first Tuesday in December, 1805.

35. Comparative Culture of Turnips. For the best set of experiments made on not less than eight acres of land, four of which to be sown broad-cast, and four drilled, to ascertain whether it is most advantageous to cultivate turnips by sowing them broadcast and hand-hoeing them, or by drilling them in equidistant rows, and hand or horse hoeing the intervals; the silver medal, or ten guineas. It is required, that every operation and expense of each mode of culture be fully described, and that proper *certificates* of the nature and condition of the land on which the experiments were made, together with the weight of the turnips grown, on a fair average sixteen perches of land, under each mode of culture, be produced to the Society on or before the first Tuesday in March, 1805. The object which the Society have in view in offering this premium is experimentally to ascertain the most advantageous method of growing turnips. To do this in a satisfactory manner, both the drilled and broad-cast crops should have the advantage of the most perfect cultivation, consequently the drilled crops should have the intervals between the rows worked by the horse or hand hoe, or by both these implements; and the rows should be either weeded or hand-hoed, or both weeded and hand-hoed. The broadcast crop should have every advantage which weeding and hand-hoeing can give it, consistently with leaving the soil a flat surface.

36. The same premium is extended one year farther. *Certificates* to be produced on or before the first Tuesday in March, 1806.

37. Parsnips. To the person who, in the year 1804, shall cultivate the greatest quantity of land, not less than five acres, with parsnips, for the sole purpose of feeding cattle or sheep; the gold medal. *Certificates* of the quantity of land so cultivated, with a particular *account* of the nature of the soil and weight of the produce on sixteen perches, and also of the condition of the cattle or sheep fed with the parsnips, and the advantages resulting from the practice, to be produced to the Society on or before the second day in February, 1805.

38. Buck Wheat. To the person who shall cultivate the greatest quantity of land with buck wheat, not less than thirty acres; the gold medal. It is required that the time of sowing and reaping be noticed; also a particular *account* of the species, cultivation, and expense attending it, the manner of reaping it, thrashing it, and housing the grain; with proper *certificates* of the nature and condition of the land on which the experiments were made, and the name of the crop, if any, which the same land bore the preceding year, together with an *account* of the produce, and a sample of the seed, not less than a quart, be produced to the Society on or before the second Tuesday in January, 1805.

39. For the next greatest quantity, not less than fifteen acres, on similar conditions; the silver medal. Information respecting its application to the feeding of cattle, hogs, and

poultry, and other of its uses, is also desired. It is known to be particularly serviceable in furnishing honey to bees.

40. Raising Grass Seeds. To the person who shall raise the greatest quantity of each or any of the following named grass seeds, *viz.* —Meadow fox-tail (alopecurus pratensis), sweet-scented vernal grass (anthoxanthum odoratum), Timothy grass, meadow Fescue grass, smooth-stalked meadow grass (poa pratensis), rough-stalked meadow grass (poa trivialis); the silver medal, or ten guineas. It is required that *certificates* from persons who have viewed them in a proper state, to identify that they are one or other of the seeds above mentioned, indicating clearly the particular species, and noticing the quantity produced of such seeds, free from weeds or mixture of other grasses, together with proper samples of the seeds, be produced to the Society on or before the first day of February, 1805.

41. The same premium is extended one year farther. *Certificates* to be produced on or before the first day of February, 1806.

42. Rotation of Crops. To the person who shall, between the 10th of August, 1801, and the 10th of September, 1803, cultivate the greatest quantity of land, not less than forty acres, in the following rotation, *viz.* 1st, winter tares; 2d, turnips; and 3d, wheat; and apply the two former crops in the best and most farmer-like manner, to the rearing, supporting, and fattening horses, cattle, sheep, or hogs, on the land which produced the crops; the gold medal, or one hundred guineas.

43. For the next in quantity and merit, on not less than thirty acres, the silver medal, or fifty guineas.

44. For the next in quantity and merit, on not less than twenty acres, the silver medal. It is required, that every operation and expense be fully described, and that satisfactory *certificates* of the nature and condition of the soil on which the crops have grown, together with an *account* of their appearance, the number of horses and cattle, sheep or hogs, fed by the two green crops, and, as near as possible, the improved value of the live stock by the consumption of those crops, and also the quantity of wheat per acre, and its weight per bushel, be produced to the Society on or before the first day of November, 1804.

It is presumed that very great advantages will arise to such agriculturists as shall adopt this rotation of crops on a dry soil. They will be enabled, with the addition of a few acres of turnip-rooted cabbage for spring-food, to keep such large flocks of sheep and herds of neat cattle as may secure a sufficient quantity of manure to fertilize their land in the highest degree, and in every situation. It is farther conceived, that wheats which will bear sowing in the spring will be particularly suitable for this premium.

45, 46, 47. The same premiums are extended one year farther. *Certificates* to be delivered on or before the first day of November, 1805.

48. Preserving Turnips. To the person who shall discover to the Society the best and cheapest method of preserving turnips perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle, during the months of February, March, and April; the silver medal, or ten guineas. It is required that a full and accurate *account* of the method employed, and the expense attending the process, together with *certificates* that the produce of four acres at the least have been preserved according to the method described, and applied to the feeding of sheep and neat cattle; that the whole were drawn out of the ground before the first day of February, in order to clear the greater part of it previous to its being prepared for corn, and to save the soil from being exhausted by the turnips; and also of the weight of an average sixteen perches of the crop; be produced to the Society on or before the first Tuesday in November, 1804.

N.B. *It is recommended to those who may be induced to try the necessary experiments for obtaining this and the following four premiums, to consider the method employed for the preservation of potatoes in ridges (which the growers call pies), and also the propriety of adopting a similar method in cases where they are previously frozen. It is supposed that, in the latter instance, the addition of ice or snow, and the construction of the ridges upon a large scale, may be sufficient to preserve the freezing temperature till the vegetables are wanted for the use of cattle or sheep, at which time they may be thawed by immersion in cold water, and the rot which a sudden thaw produces may be prevented.*

49. For the next in quantity and merit, on not less than two acres, the silver medal.

50. Preserving Cabbages. To the person who shall discover to the Society the best and cheapest method of preserving drum-headed cabbages perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle during the months of February, March, and April; the gold medal, or thirty guineas.

51. For the next in quantity and merit, on not less than two acres, the silver medal or fifteen guineas. Conditions the same as for preserving turnips, *Cl.* 48. And the *accounts* to be produced on or before the first Tuesday in November, 1805.

52. Preserving Carrots, Parsnips, or Beets. To the person who shall discover to the Society the best and cheapest method of

preserving carrots, parsnips, or beets, perfectly sound, and in every respect fit for the purpose of supporting horses, and fattening sheep and neat cattle, during the months of February, March, and April; the silver medal, or fifteen guineas. Conditions the same as for preserving turnips, *Cl.* 48. And the *accounts* to be delivered in on or before the first day in November, 1805.

53. Preserving Potatoes. To the person who shall discover to the Society the best and cheapest method of preserving potatoes, two or more years, perfectly sound, without vegetating, and in every other respect fit for the purpose of sets and the use of the table, and, consequently, of supporting and fattening cattle; the gold medal, or thirty guineas. It is required, that a full and accurate *account* of the method employed, and the expense attending the process, with *certificates* that one hundred bushels at the least have been preserved according to the method described, and that one or more bushels of the same potatoes have been set, and produced a crop without any apparent diminution of their vegetative power, and also that they have been used at table, with entire satisfaction to the person who ate of them, together with a sample of one bushel, be sent to the Society on or before the first Tuesday in November, 1805.

54. Making Meadow-Hay in wet Weather. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of making meadow-hay in wet weather; the gold medal, or thirty guineas. A full *account* of the method employed, and of the expense attending the process, with not less than fifty-six pounds of the hay; and *certificates* that at least the produce of six acres of land has been made according to the method described, and that the whole is of equal quality with the sample; to be produced on or before the first Tuesday in January, 1805.

55. Harvesting Corn in wet Weather. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of harvesting corn in wet weather; the gold medal, or thirty guineas. A full *account* of the method employed, and of the expense attending the process, with not less than two sheaves of the corn, and *certificates* that at least the produce of ten acres has been harvested according to the method described, and that the whole is of equal quality with the samples, to be produced on or before the first Tuesday in January, 1805.

56. Ascertaining the component Parts of arable Land. To the person who shall produce to the Society the most satisfactory set of experiments to ascertain the due proportion of the several component parts of rich arable land, in one or more counties in Great Britain, by an accurate analysis of it; and who having made a like analysis of some poor arable land, shall, by comparing the component parts of each, and thereby ascertaining the deficiencies of the poor soil, improve a quantity of it, not less than one acre, by the addition of such parts as the former experiments shall have discovered to be wanting therein, and therefore probably the cause of its sterility; the gold medal, or forty guineas. It is required, that the manurings, ploughings, and crops, of the improved land, be the same after the improvement as before; and that a minute *account* of the produce in each state, of the weather, and of the various influencing circumstances, together with the method made use of in analysing the soils, be produced, with proper *certificates* and the chemical results of the analysis, which are to remain the property of the Society, on or before the last Tuesday in February, 1805.

It is expected that a quantity, not less than six pounds, of the rich, of the poor, and of the improved soils, be produced with the *certificates*.

57. Gaining Land from the Sea. To the person who shall produce to the Society an account, verified by actual experiment, of his having gained the greatest quantity of land from the sea, not less than fifty acres, on the coast of Great Britain or Ireland; the gold medal. *Certificates* of the quantity of land, and that the experiments were begun after the 1st of January, 1798, to be produced to the Society on or before the last Tuesday in October, 1804.

58. The same premium is extended one year farther. *Certificates* to be produced on or before the last Tuesday in October, 1805.

59. The same premium is extended one year farther. *Certificates* to be produced on or before the last Tuesday in October, 1806.

60. Improving Land lying waste. For the most satisfactory *account* of the best method of improving any of the following soils, being land lying waste or uncultivated, *viz.* clay, gravel, sand, chalk, peat-earth and bog, verified by experiments on not less than fifty acres of land; the gold medal, or thirty guineas.

61. For the next greatest quantity, not less than thirty acres, the silver medal, or twenty guineas. It is required, that the land before such improvement be absolutely uncultivated; and in a great measure useless, and that, in its improved state, it be enclosed, cultivated, and divided into closes. *Certificates* of the number of acres, of the quality of the land so improved, with a full *account* of every operation and expense attending such improvement, the state it is in as to the proportion of grass to arable, and the average value thereof, to be produced on or before the first Tuesday in February, 1805.

62. Manures. For the most satisfactory set of experiments, to ascertain the comparative

advantages of the following manures, used as top-dressings on grass or corn land, viz. soot, coal-ashes, wood-ashes, lime, gypsum, night-soil, or any other fit article; the gold medal, or the silver medal and ten guineas. It is required that the above experiments be made between two or more of the above-mentioned manures, and that not less than two acres of land be dressed with each manure. An *account* of the nature of the soil, quantity and expense of the manure and crops, with *certificates*, to be produced on or before the last Tuesday in February, 1805.

63. The same premium is extended one year farther. The *accounts* and *certificates* to be produced on or before the last Tuesday in February, 1806.

64. Raising Water for the Irrigation of Land. To the person who shall discover to the Society the cheapest and most effectual method of raising water in quantities sufficient to be beneficially employed for the purpose of irrigating land, superior to and cheaper than any other method now in use; the gold medal, or fifty guineas. A model on a scale of one inch to a foot, with *certificates* that a machine at large, on the same construction, has been used, specifying the quantity of water delivered in gallons per hour, and the height to which it was raised, to be produced to the Society on or before the first of March, 1805.

65. The same premium is extended one year farther. *Certificates* to be produced on or before the first of March, 1806.

66. Paring Plough. To the person who shall invent and produce to the Society, a machine or plough for the purpose of paring land preparatory to burning, superior to any hitherto known, or in use for such purpose, and to be worked by not more than one man and two horses; the silver medal, or twenty guineas. The machine, and *certificates* that at least three acres have been pared by it in a proper manner, to be produced to the Society on or before the first of January, 1805.

67. Machine for Dibbling Wheat. To the person who shall invent a machine, superior to any hitherto known or in use, to answer the purpose of dibbling wheat, by which the holes for receiving the grain may be made at equal distances and proper depths; the silver medal and ten guineas. The *machine*, with *certificates* that at least three acres have been dibbled by it, to be produced to the Society on or before the second Tuesday in January, 1805. Simplicity and cheapness in the construction will be considered as principal parts of its merit.

68. Machine for Reaping or Mowing Corn. For inventing a machine to answer the purpose of mowing or reaping wheat, rye, barley, oats, or beans, by which it may be done more expeditiously and cheaper than by any method now practised, provided it does not shed the corn or pulse more than the methods in common practice, and that it lays the straw in such a manner that it may be easily gathered up for binding; the gold medal, or thirty guineas. The *machine*, with *certificates* that at least three acres have been cut by it, to be produced to the Society on or before the second Tuesday in December, 1804. Simplicity and cheapness in the construction will be considered as principal parts of its merit.

69. Thrashing Machine. To the person who shall invent a machine by which corn of all sorts may be thrashed more expeditiously, effectually, and at a less expense, than by any method now in use; the gold medal, or thirty guineas. The *machine*, or a model, with proper *certificates* that such a machine has been usefully applied, that at least thirty quarters have been thrashed by it, and of the time employed in the operation, to be produced to the Society on or before the last Tuesday in February, 1805.

70. Destroying the Grub of the Cockchafer. To the person who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying the grub of the cockchafer, or of preventing or checking the destructive effects which always attend corn, peas, beans, and turnips, when attacked by those insects; the gold medal, or thirty guineas. The *accounts*, with proper *certificates*, to be produced on or before the first Tuesday in January, 1805.

71. Destroying Worms. To the person who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying worms, or of preventing the destructive effects they occasion on corn, beans, peas, or other pulse; the gold medal, or thirty guineas. The *accounts*, with proper *certificates*, to be produced to the Society on or before the first Tuesday in January, 1805.

72. Destroying the Fly on Hops. To the person who shall discover to the Society an easy and efficacious method of destroying the fly on hops, superior to any hitherto known or practised, on not less than four acres of hop-ground; the gold medal, or thirty guineas. *Accounts* and *certificates* to be delivered to the Society on or before the first Tuesday in February, 1805.

73. Preventing the Blight, or Ravages of Insects, on Fruit-Trees and Culinary Plants. To the person who shall discover to the Society the most effectual method of preventing the blight, or ravages of insects on fruit-trees and culinary plants, superior to any hitherto known or practised, and verified by actual and comparative experiments; the gold medal, or thirty guineas. The *accounts*, with proper *certificates*, to be delivered to the Society on or before the second Tuesday in November, 1804.

74. The same premium is extended one year farther. The *accounts* and *certificates* to be delivered on or before the second Tuesday in November, 1805.

75. Removing the ill Effects of Blights, or Insects. To the person who shall discover to the Society the most effectual method of removing the ill effects of blights, or insects, on fruit-trees and culinary plants, superior to any hitherto known or practised, and verified by actual and comparative experiments; the gold medal, or thirty guineas. The *accounts* and *certificates* to be delivered to the Society on or before the first Tuesday in February, 1805.

76. Cure of the Rot in Sheep. To the person who shall discover to the Society the best and most effectual method of curing the rot in sheep, verified by repeated and satisfactory experiments; the gold medal, or fifty guineas. It is expected that the candidates furnish accurate *accounts* of the symptoms and cure of the disease, together with the imputed cause thereof, and the actual or probable means of prevention, which, with proper *certificates*, must be delivered to the Society on or before the first Tuesday in February, 1805.

77. Cure of the Foot-Rot in Sheep. To the person who shall discover to the Society the best and most effectual method of curing the foot-rot in sheep; the silver medal, or ten guineas. It is required, that the cure be ascertained by repeated and satisfactory experiments, and the method of performing it be verified by proper *certificates* delivered to the Society on or before the first Tuesday in February, 1805.

78. Preventing the ill Effects of Flies on Sheep. To the person who shall discover to the Society the most effectual method of protecting sheep from being disturbed and injured by flies; the silver medal, or ten guineas. It is required, that the method be ascertained by repeated experiments, and that a *certificate* of its efficacy be delivered to the Society on or before the first Tuesday in December, 1804.

79. Protecting Sheep. To the person who, in the year 1803, shall protect the greatest number of sheep, not fewer than one hundred, by hovels, sheds, or any other means, and give the most satisfactory account, verified by experiment, of the advantages arising from the practice of protecting sheep from the inclemency of the weather, by hovels, sheds, or any other means; the silver medal, or twenty guineas. A particular *account* of the experiments made, with the advantages arising therefrom, together with the expense, and *certificates* of its utility, to be produced to the Society on or before the first Tuesday in March, 1805.

80. The same premium is extended one year farther. The *accounts* and *certificates* to be delivered on or before the first Tuesday in March, 1806.

N.B. It is required that the *certificates* shall specify the length of time the sheep were so protected, and the manner in which they were maintained during that time; together with the general method of managing them.

81. Improving the Condition of the labouring Poor, by erecting Cottages, and apportioning Land. To the person who, in the year 1803, shall erect the greatest number of cottages for the accommodation of the labouring poor, and apportion not less than two acres of land to each cottage; the gold medal. The *accounts* and *certificates* to be delivered to the Society on or before the first Tuesday in February, 1805.

82. The same premium is extended one year farther. The *accounts* and *certificates* to be delivered to the Society on or before the first Tuesday in February, 1806.

83. Improving the Condition of the labouring Poor by apportioning Land to Cottages. To the person who, in the year 1803, shall apportion to the greatest number of cottages already built upon his or her estate, any quantity of land, not less than two acres to each cottage, for the better accommodation of the respective inhabitants; the gold medal. The *accounts* of the number of cottages, and of the quantity of land apportioned to each, to be delivered to the Society, with proper *certificates*, on or before the first Tuesday in February, 1805.

84. The same premium is extended one year farther. The *accounts* and *certificates* to be delivered on or before the first Tuesday in February, 1806.

85. Culture of Hemp in certain parts of Scotland. The Society for the Encouragement of Arts, Manufactures, and Commerce, wishing to encourage the growth of hemp for the use of the navy in certain parts of Scotland, comprehending the whole county of Argyle, that part of Perthshire situated to the north of the river Tay, and west of the Military Road (see Ainslie's Map of Scotland) leading from Logierait to the county of Inverness, and such other parts of Scotland as lie north of Inverness-shire, offers to the person who shall sow with hemp, in drills at least eighteen inches asunder, the greatest quantity of land in the above-mentioned district, not less than fifty acres statute measure, in the year 1804, and shall at the proper season cause to be plucked the summer hemp (or male hemp bearing no seed), and continue the winter hemp (or female hemp bearing seed) on the ground until the seed is ripe, the gold medal, or fifty guineas.

86. To the person who shall sow with hemp, in drills at least eighteen inches asunder, the

next greatest quantity of land in the same above-mentioned district, not less than twenty-five acres, statute measure, in the year 1804, and shall at the proper season cause the same to be plucked as above mentioned; the silver medal, or twenty-five guineas. *Certificates* of the number of acres, of the distance of the drills, of the plucking of the hemp, with a general *account* of the soil, cultivation, and produce, to be delivered to the Society, along with fourteen pounds of the hemp, and two quarts of the seed, on or before the second Tuesday in January, 1805.

PREMIUMS FOR DISCOVERIES AND IMPROVEMENTS IN CHEMISTRY, DYING, AND MINERALOGY.

87. Preserving Seeds of Vegetables. For the best methods of preserving the seeds of plants in a state fit for vegetation a longer time than has hitherto been practised, such method being superior to any known to the public, and verified by sufficient trial, to be communicated to the Society on or before the first Tuesday in December, 1804; the gold medal, or thirty guineas.

88. Preventing the Dry-rot in Timber. To the person who shall discover to the Society the cause of the dry-rot in timber, and disclose a certain method of prevention superior to any hitherto known; the gold medal, or thirty guineas. The *accounts* of the cause, and method of prevention, confirmed by repeated experiments, to be produced to the Society on or before the second Tuesday in December, 1804.

89. Preserving salted Provisions from becoming rancid or rusty. To the person who shall discover to the Society the best, cheapest, and most efficacious method of preserving salted provisions from growing rancid or rusty; the gold medal, or thirty guineas. A full *description* of the method, with proper *certificates* that it has been found, on repeated trials, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1805.

90. Clearing Feathers from their animal Oil. To the person who shall discover to the Society the best and most expeditious method, superior to any hitherto practised, of clearing goose-feathers from their offensive animal oil, for the use of upholders, in making beds, cushions, &c. the silver medal, or twenty guineas. A quantity of such feathers unstripped and so cleared, not less than forty pounds weight, with a full *account* of the process, to be produced to the Society on or before the first Tuesday in February, 1805.

91. Refining Whale or Seal Oil. For disclosing to the Society an effectual method of purifying whale or seal oil from the glutinous matter that incrusts the wicks of lamps and extinguishes the light, though fully supplied with oil; the gold medal, or fifty guineas. It is required, that the whole of the process be fully and fairly disclosed, in order that satisfactory experiments may be made by the Society to determine the validity of the claim; and *certificates* that not less than twenty gallons have been purified according to the process delivered in, together with two gallons of the oil, in its unpurified state, and two gallons so refined, be produced to the Society on or before the second Tuesday in February, 1805.

92. Manufacturing Tallow Candles. To the person who shall discover to the Society a method of hardening or otherwise preparing tallow, so that candles may be made of it which will burn as clear and with as small a wick as wax candles, without running, and may be afforded at a less expense than any at present made with spermaceti; the gold medal, or thirty guineas. *Certificates* that 112lb. of such tallow have been made into candles, and 12lb. of the candles made thereof, to be produced to the Society on or before the second Tuesday in January, 1805.

93. Candles from Resin or other Substances. To the person who shall discover to the Society the best method of making candles of resin, or any other substance, fit for common use, at a price much inferior to those made of tallow only; the gold medal, or thirty guineas. Six pounds at least of the candles so prepared, with an *account* of the process, to be delivered to the Society on or before the first Tuesday in December, 1804.

94. Method of separating Sugar in a solid Form from Treacle. To the person who shall discover to the Society the best method of separating sugar from treacle, in a solid form, at such an expense as will render it advantageous to the public; the gold medal, or fifty guineas. A quantity of the sugar so prepared, in a solid form, not less than thirty pounds weight, with an *account* of the process, and *certificates* that not less than one hundred weight has been prepared, to be produced to the Society on or before the first Tuesday in February, 1805.

95. PROOF-SPIRIT. To the distiller who, in the year 1804, shall make the greatest quantity, not less than one hundred gallons, of a clean marketable spirit, from articles not the food of man or cattle, equal in strength or quality to the proof-spirit now in use, and at a rate not higher than the spirit produced from corn or melasses; the gold medal, or one hundred guineas. Ten gallons of the spirit, together with proper *certificates*, and a full *account* of the expense and mode of making it, to be produced to the Society on or before the first Tuesday in January, 1805.

96. Increasing Steam. To the person

who shall invent and discover to the Society a method, verified by actual experiments, of increasing the quantity or force of steam, in steam-engines, with less fuel than has hitherto been employed, provided that in general the whole amount of the expenses in using steam-engines may be considerably lessened; the gold medal, or thirty guineas. To be communicated to the Society on or before the first Tuesday in January, 1805.

97. Substitute for Tar. To the person who shall invent and discover to the Society the best substitute for Stockholm tar, equal in all its properties to the best of that kind, and prepared from materials the produce of Great-Britain; the gold medal, or one hundred guineas. A quantity of the substitute, not less than one hundred weight, with *certificates* that at least one ton has been manufactured, and that it can be afforded at a price not exceeding that of the best foreign tar, together with an *account* of the process, to be delivered to the Society on or before the first Tuesday in March, 1805.

98. Preparation of Tan. To the person who shall prepare in the most concentrated form, so as to be easily portable, and at a price applicable to the purposes of manufactures, the largest quantity, not less than one hundred weight, of the principle called by the French *tannin*, which abounds in oak-bark and many other vegetable substances; the gold medal, or fifty guineas. *Certificates* of the superior quality of the quantity so prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1805.

99. Indelible Ink. To the person who shall discover to the Society, a method of making a black ink proper for writing, superior to any at present known, indestructible by chemical applications, and not dearer than that which is now in common use; the silver medal or fifteen guineas. *Certificates* that not less than two gallons of such ink have been actually prepared and found to possess the qualities above mentioned, with a full detail of the process of making it, and two quarts of the ink, to be delivered to the Society on or before the second Tuesday in January, 1805.

100. Preparation of a red Stain for Cotton Cloth. To the person who shall communicate to the Society, the cheapest and most effectual method of printing or staining cotton cloths with a red colour, by an immediate application of the colouring-matter to the cloth, equally beautiful and durable with the red colours now generally procured from decoctions of madder; the gold medal, or thirty guineas. *Certificates* that the above process has been advantageously used on ten pieces of calico, each twenty-one yards or upwards in length, one piece of the calico so printed, a quart of the colour in a liquid state, and a full *account* of the preparation and application, to be produced to the Society on or before the second Tuesday in January, 1805.

101. Preparation of a green Colour for printing Cotton Cloth. To the person who shall communicate to the Society the best and cheapest method of printing with a full green colour on cotton cloth, by an immediate application of the colouring matter from a wooden block to the cloth, equally beautiful and durable as the colours now formed from the complicated process of the decoction of weld on alumine and the solutions of indigo by earths or alkaline salts; the gold medal, or thirty guineas. *Certificates* and conditions as for premium 100.

102. Substitute for the Basis of Paint. To the person who shall produce to the Society the best substitute, superior to any hitherto known, for the basis of paint, equally proper for the purpose as the white lead now employed; such substitute not to be of a noxious quality, and to be afforded at a price not materially higher than that of white lead; the gold medal, or one hundred guineas. A quantity of the substitute, not less than 50lb. weight, with an *account* of the process used in preparing it, and *certificates* that at least one hundred weight has been manufactured, to be produced to the Society on or before the first Tuesday in January, 1805.

103. Red Pigment. To the person who shall discover to the Society a full and satisfactory process for preparing a red pigment, fit for use, in oil and water, equal in tone and brilliancy to the best carmines and lakes now known or in use, and perfectly durable; the gold medal, or thirty guineas. One pound weight of such colour, and a full disclosure of its preparation, to be produced to the Society on or before the first Tuesday in Feb. 1805.

N. B. It is not required that the colour should resist the action of fire or chemical applications, but remain unaltered by the common exposure to strong light, damps, and noisome vapours.

104. Ultramarine. To the person who shall prepare an artificial ultramarine, equal in colour, brilliancy, or durability, to the best prepared from lapis lazuli, and which may be afforded at a cheap rate; the gold medal, or thirty guineas. The conditions are the same as in the preceding premium for the red pigment.

105. Analysis of British Minerals. To the person who shall communicate to the Society, the most correct analysis of any mineral production of Great-Britain, hitherto either unexamined, or not examined with accuracy; the gold medal. The analysis and sufficient specimens to be produced to the Society on or before the first Tuesday in Jan. 1805.

106. Statuary Marble. To the person

who shall discover, within Great-Britain or Ireland, a quarry of white marble fit for the purposes of statuary, and equal in all respects to those kinds now imported from Italy; the gold medal, or one hundred pounds. A block of at least three feet in length, two in height, and two in width, with an account of the situation of the quarry, and *certificates* of its possessing considerable extent, to be produced to the Society on or before the first Tuesday in February, 1805.

N. B. In order to prevent useless expense or trouble to the claimant in forwarding so large a block, the Society will be ready to examine any smaller specimen of the marble, and express their opinion of its value to the candidate before the block required by the above premium is produced.

107. Preparation of Sulphuric Acid from Sulphur without the Use of any Nitric Salt. To the person who shall prepare the largest quantity (not less than one ton) of sulphuric acid from sulphur, without any nitric salt, of a specific gravity, not inferior to the best sulphuric acid of commerce; the gold medal, or fifty guineas. *Certificates* that not less than the above quantity of such an acid has been prepared, together with a sample, to be produced to the Society on or before the first Tuesday in January, 1805.

108. Preparation of any alkaline or earthy Nitrate. To the person who shall prepare, in Great-Britain, the largest quantity, not less than one hundred weight, of any salt of nitric acid, with either earths or alkalies, by a method superior to and as cheap as those hitherto practised; the gold medal, or one hundred guineas. *Certificates* of the above quantity having been prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1805.

109. Fine Bar-Iron. To the person, in Great-Britain, who shall make the greatest quantity of bar-iron, not less than ten tons, with coak, from coak-pigs, equal in quality to the best iron imported from Sweden or Russia, and as fit for converting into steel; the gold medal, or fifty guineas. Samples, not less than one hundred weight, with *certificates* that the whole quantity is of equal quality, to be produced to the Society on or before the first Tuesday in January, 1805.

110. Preserving Iron from Rust. To the person who shall invent and discover to the Society a cheap composition, superior to any now in use, which shall effectually preserve wrought iron from rust, the gold medal, or fifty guineas. A full description of the method of preparing the composition, with *certificates* that it has stood at least two years unimpaired, being exposed to the atmosphere during the whole time, to be produced to the Society, with ten pounds weight of the composition, on or before the first Tuesday in January, 1805.

111. Refining Block-Tin. To the person who shall discover to the Society the best method of purifying or refining block-tin, so as to render it fit for the finest purposes to which grain-tin is now applied, and not higher in price; the gold medal, or fifty guineas. *Certificates* that not less than three tons have been so refined or purified, with a full detail of the process, and a quantity, not less than one hundred weight, of the tin so refined, to be produced to the Society on or before the first Tuesday in January, 1805.

112. Glazing Earthen-Ware without Lead. To the person who shall discover to the Society the cheapest, safest, most durable, and most easily fusible, composition, fit for the purpose of glazing the ordinary kinds of earthen-ware, without any preparation of lead, and superior to any hitherto in use; the gold medal, or thirty guineas. Specimens of the ware so glazed, with proper *certificates* of its having succeeded, and a sample of the materials made use of, to be produced to the Society on or before the first Tuesday in Feb. 1805.

113. Refining Copper from the Ore. To the person who shall discover to the Society the best method of separating, purifying, and refining copper from the ore, so as to render it fit for the finest purposes to which fine copper is now applied, and by a process superior to any hitherto known or in use, and not higher in price; the gold medal, or fifty guineas. *Certificates* that not less than three tons have been so prepared or refined, and a quantity not less than one hundred weight of the copper so refined, to be produced to the Society on or before the first Tuesday in Feb. 1805.

114. Mineralogical Map of England and Wales. To the person who shall complete and publish an accurate mineralogical map of England and Wales, on a scale of not less than ten miles to an inch, containing an account of the situation of the different mines therein, and describing the kinds of minerals thence produced; the gold medal, or fifty guineas. *Certificates* of the accuracy of such map, together with the map, to be produced to the Society on or before the first Tuesday in February, 1805. The map to remain the property of the Society.

115. Mineralogical Map of Ireland. The same premium is offered for a mineralogical map of Ireland, on similar conditions.

116. Mineralogical Map of Scotland. The same premium is offered for a mineralogical map of Scotland, on similar conditions.

117. Natural History. To the author who shall publish, in the year 1804, the natural history of any county in England or Wales; the gold medal, or fifty guineas. It is required that the several natural productions,

whether animal, or vegetable, or mineral, peculiar to the county, or found therein, be carefully and specifically arranged and described, in order that the public may be enabled to judge what arts or manufactures are most likely to succeed in such county. The work to be delivered to the Society on or before the last Tuesday in January, 1805.

PREMIUMS IN POLITE ARTS.

118. Honorary Premiums for Drawing, by Nobility. For the best original drawing, of any kind, by young gentlemen under the age of twenty-one, sons or grandsons of peers, or peeresses in their own right, of Great-Britain or Ireland, to be produced on or before the first Tuesday in March, 1805; the honorary medal of the Society in gold.

119. The same in silver for the best copy.

120, 121. The same premiums will be given, on the like conditions, to young ladies, daughters or grand-daughters of peers, or peeresses in their own right, of Great-Britain or Ireland.

122. Honorary Premiums for Drawing, by Gentlemen. For the best original drawing, of any kind, by young gentlemen under the age of twenty-one; to be produced on or before the first Tuesday in March, 1805; the gold medal.

123. For the best copy, the silver medal.

124, 125. The same premiums will be given for drawings by young ladies.

N. B. As the foregoing honorary premiums are intended only for such of the nobility and gentry as may hereafter become patrons or patronesses of the arts; persons professing any branch of the polite arts, or any business dependent on the arts of design, or the sons or daughters of such persons, will not be admitted candidates in these classes.

126. Drawings of Outlines. For the best outline, after a cast, in plaster, of the Venus de Medicis, by persons of either sex, under the age of sixteen, the figure not less than eighteen inches; to be produced on or before the last Tuesday in February, 1805; the greater silver pallet.

127. For the next in merit; the lesser silver pallet.

128. Drawings of Landscapes. For the best drawing in water-colours of a landscape after nature, not less than eighteen inches by twelve, by persons of either sex, under twenty-one years of age, to be produced on or before the last Tuesday in February, 1805; the gold pallet.

129. For the next in merit, the greater silver pallet. Each candidate must mention, on the front of the drawing, whence the view was taken.

130. Historical Drawings. For the best historical drawing, being an original composition, of five or more human figures; the height of the principal figure not less than eight inches; to be produced on or before the third Tuesday in Feb. 1805; the gold pallet.

131. For the next in merit; the greater silver pallet.

132. Drawing and Engraving. To the person who shall complete the best original drawing and engraving. The design and engraving to be executed by the same artist, and produced to the Society on or before the first Tuesday in February, 1805; the gold medal. It is required that the drawing and two impressions of the engraving be produced, and remain the property of the Society.

133. Line Engravings of Landscapes. For the best line engraving of a landscape, published in the year 1804, the size of the engraving not less than eighteen inches by fourteen; the gold medal. To be produced to the Society on or before the last Tuesday in January, 1805; and the impression to which the premium is adjudged to remain the property of the Society.

134. For the next in merit; the silver medal, on similar conditions.

135. Line Engravings of Historical Subjects. For the best line engraving published in the year 1804, of an historical subject, the size of the engraving not less than eighteen inches by fourteen; the gold medal.

136. For the next in merit; the silver medal. Conditions, &c. the same as in classes 133 and 134.

137, 138, 139, 140. The same premiums are extended one year farther.

N. B. It is not necessary in the classes of line engravings, for the artist's name to be concealed. The first aquafortis proof of the above plates are required to be sent in with the finished impression, and *certificates* that the etchings are the entire work of the candidate. The aquafortis proof also to remain the property of the Society.

141. Model in Clay or Plaster. For the best model in clay or plaster of an ornamental design for the purpose of embellishing works of architecture; the silver medal or twenty guineas. To be produced to the Society on or before the last Tuesday in January, 1805. The model not to be less than thirty inches by twelve.

142. Perspective Drawings of Machines. For the best perspective drawing of machines by persons under twenty-one years of age; the greater silver pallet. To be produced to the Society on or before the last Tuesday in January, 1805.

143. For the next in merit; the lesser silver pallet, on similar conditions.

144. Engraving on Wood, or Metal Blocks, &c. For the best engraving on wood or metal blocks, or any other material,

so that the same be rendered capable of composition with the letter-press, of any allegorical or other subject suited to the embellishment of letter-press, the gold pallet.

145. For the next in merit, the greater silver pallet. Two or more impressions along with the block to be produced to the Society on or before the first Tuesday in February, 1805. The impressions, but not the block, to remain the property of the Society.

146. Bronzes. For the best drapery figure or group cast in bronze; if a single figure, not less than twelve inches high; and, if a group, not less than nine inches; and which will require the least additional labour to repair; the gold medal, or the silver medal and twenty guineas. The cast to be exhibited to the Society before it is begun to be repaired, with the original figure or group, on or before the first Tuesday in February, 1805, together with a full explanation of the whole process.

147. Ornamental Drawings for Architectural Designs. For the best ornamental drawing for the purpose of embellishing architectural designs; a silver medallion with the following engraved inscription: *The Premium given by the Society for the Encouragement of Arts, Manufactures, and Commerce, in conformity to the Will of John Stock, of Hampstead, Esq.* The drawing to which the premium is adjudged to remain the property of the Society; and to be produced to the Society on or before the second Tuesday in February, 1805.

PREMIUMS FOR ENCOURAGING AND IMPROVING MANUFACTURES.

148. Machine for carding Silk. For the best machine, superior to any now in use, for carding waste silk equally well as by hand; to be produced, together with a specimen of the cardings, on or before the first Tuesday in November, 1804; the silver medal, or twenty guineas.

149. Cloth from Hop-stalks, &c. To the person who shall produce to the Society the greatest quantity, not less than thirty yards of cloth at least twenty-seven inches wide, made in Great-Britain, of hop-stalks or bines, or other raw vegetable substances, the produce of Great-Britain or Ireland, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as cloth of equal quality and appearance now made from hemp, flax, or cotton, and much finer in quality than any hitherto manufactured in England from hop-stalks, &c. the gold medal, or thirty guineas. One pound of the thread of which the cloth is made, and thirty yards of the cloth, together with proper *certificates* that the whole is manufactured from hop-stalks or bines, &c. to be produced to the Society on or before the first Tuesday in December, 1804.

N. B. The Society is already in the possession of cloth made in England from hop-stalks or bines, which may be inspected by application to the Housekeeper.

150. Wicks for Candles or Lamps. To the person who shall discover to the Society a method of manufacturing hop-stalks or bines, or any other cheap material, the growth of Great-Britain, so as to render them equally fit for the purpose of supplying the place of cotton, for wicks of candles or lamps; twenty guineas. Samples, not less than five pounds weight, of the wick so prepared, to be produced to the Society, with *certificates* that the whole quantity is equal in quality to the sample, on or before the second Tuesday in Jan. 1805.

151. Paper from raw vegetable Substances. To the person, in Great-Britain, who shall, between the first of January, 1804, and the first of January, 1805, make the greatest quantity, and of the best quality (not less than ten reams), of good and useful paper, from raw vegetable substances, the produce of Great-Britain or Ireland, of which one hundred weight has not been used in manufacturing paper previous to January, 1803, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as paper of equal quality and appearance now made from rags; twenty guineas.

N.B. The object of the Society being to add to the number and quantity of raw materials used in this manufacture, it is their wish to include every useful sort of paper, and to introduce such natural products as can be easily and cheaply procured in great quantities. The Society are in possession of two volumes containing a great variety of specimens of paper made from raw vegetable substances, *viz.*— nettles, potatoe-haum, poplar, hop-bines, &c. which volumes may be inspected by any person on application to the Housekeeper. *Certificates* of the making such paper, and one ream of the paper, to be produced on or before the last Tuesday in January, 1805.

152. Transparent Paper. To the person who shall discover to the Society a method of making paper from the pulp that shall be perfectly transparent, and of a substance and body equal to foolscap, that shall take and bear common writing ink with the same facility and correctness as writing-paper generally in use; the silver medal, or twenty guineas. *Certificates* of the making such paper, an *account* of the process, and one ream of the paper, to be produced on or before the second Tuesday in January, 1805.

153. Chints Patterns for Calico-Printers. For the best original pattern in a new taste, of light or dark-ground chints for garment-work, fit for the purposes of calico-

printers, by persons of either sex; the gold medal. To be produced to the Society on or before the second Tuesday in January, 1805; the pattern to which the premium is adjudged to remain the property of the Society.

154. For the next in merit; the silver medal, on similar conditions.

155. Copper-plate Patterns for Calico-Printers. For the best pattern, in a new style, fit for the purposes of calico-printers for garment-work; the silver medal. To be produced to the Society on or before the second Tuesday in January, 1805. The pattern to which the premium is adjudged to remain the property of the Society.

PREMIUMS IN MECHANICS.

156. Gunpowder-Mills. To the person who, in the year 1804, shall invent and bring to perfection the most effectual method of so conducting the works of gunpowder-mills, in the business of making gunpowder, as to prevent explosion; the gold medal, or one hundred guineas. *Certificates* and *accounts* of the method having been put in practice in one or more gunpowder-mills in this kingdom, and that it promises, in the opinion of the best judges concerned in such works, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in Feb. 1805.

N.B. As an encouragement to persons to turn their thoughts to improvements of this nature, if any should be made on the present method of conducting the business of gunpowder making, which fall short of the total prevention of explosion, and they are sent to the Society for the sake of humanity, the papers so sent in will receive due consideration, and such bounty or reward will be bestowed thereon as they appear to merit.

157. Transit-Instrument. To the person who shall invent and produce to the Society a cheap and portable transit-instrument, which may easily be converted into a zenith-sector, capable of being accurately and expeditiously adjusted, for the purpose of finding the latitudes and longitudes of places, and superior to any portable transit-instrument now in use; the gold medal, or forty guineas. To be produced on or before the last Tuesday in Jan. 1805.

158. Taking Whales by the Gun-Harpoon. To the person who, in the year 1804, shall strike the greatest number of whales, not fewer than three, with the gun-harpoon; ten guineas. Proper *certificates* of the striking such whales, and that they were actually taken in the year 1804, signed by the master, or by the mate when the claim is made by the master, to be produced to the Society on or before the last Tuesday in December, 1804.

159. Family Mill. To the person who shall invent and produce to the Society the best-constructed mill for grinding corn for the use of private families, or parish-poor; the construction to be such as to render the working of the mill easy and expeditious, and superior to any hitherto in use; the gold medal, or thirty guineas. The mill, and *certificates* of its having been used to good effect, to be produced to the Society on or before the first Tuesday in Feb. 1805. Cheapness and simplicity will be considered as essential parts of its merit; and the mill, or the model, to remain with the Society.

160. Machine for raising Coals, Ore, &c. &c. To the person who shall invent a machine for raising coals, ore, &c. from mines, superior to any hitherto known or in use, and which shall produce the effect at a less expense than those already known or in use; the gold medal, or fifty guineas. A model of the machine, made on a scale of not less than one inch to a foot, with a *certificate* that a machine at large on the same construction has been advantageously used, to be produced to the Society on or before the second Tuesday in Feb. 1805.

161. Improved Walking-Wheel or Crane. To the person who shall invent an improved walking-wheel or crane, on which the weight and power of any person or persons shall be applied with the greatest safety and effect, and so contrived that the power can be varied according to the greater or lesser weight to be raised or lowered; the gold medal, or thirty guineas. The model, on a scale of not less than one inch to a foot, with a proper *certificate* that the machine at large has been employed to good effect, to be produced to the Society on or before the second Tuesday in February, 1805.

162. Machine for Raising Water. To the person who shall invent a machine on a better, cheaper, and more simple construction than any hitherto known or in use, for raising water out of wells, &c. from a depth of not less than fifty feet; the gold medal, or forty guineas. *Certificates* of the performance of the machine, and a model of it, on a scale of not less than one inch to a foot, to be produced to the Society on or before the first Tuesday in February, 1805.

163. Elm Pipes. To the person who shall invent and discover to the Society a substitute for the elm pipes now in common use for the conveyance of water, which shall be cheaper, equally effectual, and more durable than any heretofore employed; the gold medal, or thirty guineas. It is required that one of the pipes so employed, an accurate *account* of the method used, and every expense attending it, together with satisfactory accounts of its being effectual, be delivered to the Society on or before the second Tuesday in January, 1805.

164. Extinguishing Fires. To the person who shall produce to the Society the best and most effectual method of procuring an imme-

diate supply of water in case of fire, or for the means best calculated to prevent or extinguish accidental fires in buildings, superior to any now in use; the gold medal, or thirty guineas. *Certificates* of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the second Tuesday in Jan. 1805.

165. Boring and Blasting Rocks. To the person who shall discover to the Society a more simple, cheap, and expeditious method than any hitherto known or in use of boring and blasting rocks in mines, shafts, wells, &c.; the gold medal, or thirty guineas. *Certificates* of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the first Tuesday in January, 1805.

166. Heating Rooms for the purposes of Manufacturers. To the person who shall invent and discover to the Society a method of heating rooms, superior to any hitherto known or in use, and at a moderate expense, for the purposes of painters, japanners, and other manufacturers, so as to avoid the necessity of iron or copper tunnels going through the rooms to convey the smoke, whereby the danger from such tunnels may be prevented; the gold medal, or forty guineas. A model, or complete drawing and description of the method, with *certificates* that it has been successfully practised, to be delivered to the Society on or before the last Tuesday in March, 1805.

167. Improved Ventilation. To the person who shall invent and produce to the Society a mode of permanently ventilating the apartments in hospitals, workhouses, and other crowded places, superior to any now known or used; the gold medal, or fifty guineas. A model of the apparatus, and a full account of the means by which the effect has been produced, with proper *certificates*, to be delivered to the Society on or before the last Tuesday in February, 1805.

168. Preventing Accidents from Horses falling with two-wheeled Carriages. To the person who shall invent and produce to the Society a method superior to any hitherto known or in use, to prevent accidents from the falling of horses with two-wheeled carriages, especially on steep declivities; the silver medal, or fifteen guineas. A model of the apparatus, and a full account of the means by which the effect has been produced, with proper *certificates* that the same has been used with success, to be delivered to the Society on or before the second Tuesday in January, 1805.

169. Improving Turnpike and other Roads. To the person who shall discover to the Society the most effectual and cheapest method, verified by actual experiments, of combining the materials ordinarily employed in making or repairing roads, so as to form them of the hardest consistence by their cementing properties, or by an artificial mixture of earth, stones, &c. altered by heat or any other mode, so as to form an even, hard, and durable carriage-road, not liable to be injured by heat or rain; the gold medal, or fifty guineas. It is required that an accurate *account* of the method used, and every expense attending it, together with satisfactory *certificates* of its being effectual, be delivered to the Society on or before the first Tuesday in March, 1805.

170. Cleansing Chimnies. To the person who shall invent and produce to the Society the most effectual mechanical or other means for cleansing chimnies from soot, and obviating the necessity of children being employed within the flues; the gold medal.

171. For the next in merit; the silver medal. The mechanical, or other means, with *certificates* of their having been used with proper effect, to be produced to the Society on or before the first Tuesday in January, 1805.

172. Chimnies Cleansed. To the person who shall during the year 1804 cleanse, or cause to be cleansed, the greatest number of chimnies, at least two stories high, not fewer than three hundred, by any mechanical or other process, which does not require the employment of boys within the flues; the gold medal. *Certificates*, signed by not less than two-thirds of those housekeepers on whose premises the said means have been employed, and an account of the process, to be produced to the Society on or before the first Tuesday in February, 1805.

173. To the person who shall cleanse, or cause to be cleansed, the next greatest number of chimnies, not fewer than one hundred and fifty, upon similar conditions to the above; the silver medal.

174. Raising the Bodies of Persons who have sunk under Water. To the person who shall invent and produce to the Society a cheap and portable drag, or other machine, superior to those now in use, for the purpose of taking up in the best and most expeditious manner, and with the least injury, the bodies of persons who have sunk under water; the gold medal, or thirty guineas. The drag, or machine to answer the purpose intended, to be produced to the Society, on or before the first Tuesday in March, 1805.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE COMMERCE OF THE UNITED EMPIRE.

175. Taking Porpoises. To the people in any boat or vessel, who, in the year 1804, shall take the greatest number of porpoises on the coast of Great-Britain or Ireland, by gun,

harpoon, or any other method, not fewer than thirty, for the purpose of extracting oil from them; the gold medal, or thirty pounds. *Certificates* of the number, signed by the persons to whom they have been sold or delivered for the purpose of extracting the oil, to be produced to the Society on or before the last Tuesday in January, 1805.

176. Oil from Porpoises. To the person who shall manufacture the greatest quantity of oil from porpoises taken on the coast of Great-Britain or Ireland, in the year 1804, not less than twenty tons; the gold medal, or thirty pounds. *Certificates* of the oil having been made from porpoises actually caught on the coast of Great-Britain or Ireland, and two gallons of the oil as a sample, to be produced to the Society on or before the last Tuesday in February, 1805.

177. Curing Herrings by the Dutch Method. To the person or persons who shall, before January, 1805, cure the greatest quantity of white herrings, not less than thirty barrels, according to the method practised by the Dutch, and equal in all respects to the best Dutch herrings, the same being caught in the British or Irish Seas, and cured in a British or Irish vessel or port; the gold medal, or fifty guineas.

178. For the next greatest quantity, not less than fifteen barrels; the silver medal, or twenty guineas. A sixteen-gallon barrel of the herrings to be produced to the Society on or before the first Tuesday in February, 1805, with *certificates* that the conditions of the premium have been completely fulfilled, and that the whole were cured in the same manner as the specimen, together with a full description of the process employed, in order that the Society may judge how far the Dutch method has been adopted.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH COLONIES.

179. Nutmegs. For the greatest quantity of merchantable nutmegs, not less than ten pounds weight, being the growth of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or the several Islands adjacent thereto, and equal to those imported from the islands of the East Indies; the gold medal, or one hundred guineas. Satisfactory *certificates*, from the governor, or commander in chief, of the place of growth, with an account of the number of trees, their age, nearly the quantity of fruit on each tree, and the manner of culture, to be produced on or before the first Tuesday in December, 1804.

180. The same premium is extended one year farther. *Certificates* to be produced on or before the first Tuesday in December, 1805.

181. Cloves. For importing into Great Britain or Ireland, in the year 1804, the greatest quantity of cloves, not less than twenty pounds weight, being of the growth of some of the islands in the West Indies subject to the British empire, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, and equal in goodness to the cloves brought from the East Indies; the gold medal, or fifty guineas. Samples, not less than two pounds weight, with *certificates* that the whole quantity is equal in goodness, together with satisfactory *certificates* signed by the governor, or commander in chief, of the place of growth, with an *account* of the number of trees growing on the spot, their age, and the manner of culture, to be produced to the Society on or before the first Tuesday in January, 1805.

182. The same premium is extended one year farther. *Certificates* to be produced on or before the first Tuesday in January, 1806.

183. Kali for Barilla. To the person who shall have cultivated, in the Bahama Islands, or any other part of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, in the year 1805, the greatest quantity of land, not less than two acres, with Spanish kali, fit for the purpose of making barilla; the gold medal, or thirty guineas.

184. For the next greatest quantity, not less than one acre; the silver medal, or fifteen guineas. *Certificates*, signed by the governor, or commander in chief, for the time being, of the quantity of land so cultivated, and of the state of the plants at the time of signing such *certificates*, to be delivered to the Society, with samples of the kali, on or before the second Tuesday in January, 1805.

185, 186. The same premiums are extended one year farther. *Certificates* to be produced on or before the second Tuesday in Jan. 1806.

187. Destroying the Insect commonly called the Borer. To the person who shall discover to the Society an effectual method of destroying the insect commonly called the borer, which has, of late years, been so destructive to the sugar-canes in the West-India islands, the British settlements on the coast of Africa, and the several islands adjacent thereto; the gold medal, or fifty guineas. The discovery to be ascertained by satisfactory *certificates*, under the hand and seal of the governor or commander in chief, for the time being, and of some other respectable persons, inhabitants of the islands, or other place, in which the remedy has been successfully applied; such *certificates* to be delivered to the Society on or before the first Tuesday in January, 1805.

188. Cultivation of Hemp in Upper and Lower Canada. To the person who shall sow with hemp the greatest quantity of land in the province of Upper Canada, not less than six arpents (each four-fifths of a statute acre), in the year 1804, and shall at the proper season cause to be plucked the summer hemp (or male hemp bearing no seed) and continue the winter hemp (or female hemp bearing seed) on the ground until the seed is ripe; the gold medal, or one hundred dollars.

189. To the person who shall sow with hemp the next greatest quantity of land in the same province of Upper Canada, not less than five arpents, in the year 1804, in the manner abovementioned; the silver medal, or eighty dollars.

190. For the next greatest quantity of land, in the same province, and in a similar manner, not less than four arpents; sixty dollars.

191. For the next greatest quantity of land, in the same province, and in a similar manner, not less than three arpents; forty dollars.

192. For the next greatest quantity of land, in the same province, and in a similar manner, not less than one arpent; twenty dollars. *Certificates* of the number of arpents, the method of culture, of the plucking of the hemp, with a general *account* whether sown broad-cast or in drills, the expense, soil, cultivation, and produce, to be transmitted to the Society, certified under the hand and seal of the governor or lieutenant-governor, together with 28lb. of the hemp, and two quarts of the seed, on or before the last Tuesday in November, 1805.

193, 194, 195, 196, 197. The same premiums are extended one year farther. *Certificates*, &c. as before mentioned, to be transmitted to the Society, on or before the last Tuesday in November, 1806.

198 to 208. Premiums exactly similar in all respects to those held out for the province of Upper Canada, are also offered for the province of Lower Canada, and are extended to the same period.

209. Importation of Hemp from Canada. To the master of that vessel, which shall bring to this country the greatest quantity of marketable hemp, not less than one hundred tons, in the year 1804, the produce of Upper or Lower Canada; the gold medal.

210. To the master of that vessel which shall bring the next quantity, not less than fifty tons; the silver medal. *Certificates* satisfactory to the Society to be produced by the master of the vessel on or before the first Tuesday in February, 1805, to testify that such hemp was grown and prepared in Canada.

211, 212. The same premiums are extended one year farther. *Certificates* to be produced on or before the first Tuesday in Feb. 1806.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH SETTLEMENTS IN THE EAST INDIES.

213. Bhaugulpore Cotton. To the person who shall import into the port of London, in the year 1804, the greatest quantity, not less than one ton, of the Bhaugulpore cotton, from which cloths are made in imitation of nankeen, without dying; the gold medal. A quantity of the cotton, not less than five pounds weight in the pod, and five pounds carded, to be produced to the Society, with proper *certificates*, signed by the Secretary to the Board of Trade of Bengal or Bombay, on or before the last Tuesday in February, 1805.

214. The same premium is extended one year farther. *Certificates* to be produced on or before the last Tuesday in February, 1806.

215. Annatto. To the person who, in the year 1804, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of annatto, not less than five hundred weight; the gold medal. A quantity of the annatto, not less than ten pounds weight, to be produced to the Society, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective settlement, that the annatto is the produce of such settlement, on or before the last Tuesday in February, 1805.

216. The same premium is extended one year farther. *Certificates* to be produced on or before the last Tuesday in February, 1806.

217. True Cochineal. To the person who, in the year 1804, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of true cochineal, not less than five hundred weight; the gold medal. A quantity of the cochineal, not less than ten pounds weight, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective settlement, that the cochineal is the produce of such settlement, to be produced to the Society on or before the first Tuesday in February, 1805.

218. The same premium is extended one year farther. *Certificates* to be produced on or before the first Tuesday in February, 1806.

CONDITIONS FOR THE POLITE ARTS.

No person who has gained the first premium in any class shall be admitted a candidate in a class of an inferior age; and no candidate shall receive more than one premium in one year; nor shall they, who for two successive years have gained the first premium in one class, be again admitted as candidates in that class.

No person shall be admitted a candidate in any class, who has three times obtained the first premium in that class.

No more than one performance in any class shall be received from the same candidate.

All performances (to which premiums or bounties are adjudged) shall remain with the Society till after the public distribution of rewards in May, when they will be re-delivered unless mentioned in the premiums to the contrary.

No performance shall be admitted, that has obtained a premium, reward, or gratification, from any other society, academy, or school, or been offered for that purpose.

All performances that obtain premiums in the Polite Arts must have been begun after the publication of such premiums, except line engravings.

To encourage real merit, and prevent attempts to impose on the Society, by producing drawings made or retouched by any other person than the candidate, the Society require a specimen of the abilities of each successful candidate, under the inspection of the Committee of Polite Arts, in every instance where such proof may appear necessary.

All candidates in the Polite Arts are required to signify, on their drawings, their age; and whether the performances are originals or copies; and if copies, whence they were taken.

Society's Office, Adelphi, June 1st, 1804.

ORDERED,

That the several Candidates and Claimants, to whom the Society shall adjudge Premiums or Bounties, do attend at the Society's Office in the Adelphi, on the last Tuesday in May, 1805, at Twelve o'Clock at Noon precisely, to receive the same; that day being appointed by the Society for the Distribution of their Rewards: And before that time no Premium or Bounty will be delivered, excepting to those who are about to leave the Kingdom.

In Cases where the Society may think fit to admit excuses for not attending in Person, Deputies may be substituted to receive the Rewards, provided such Deputies are either Members of the Society, or the superior Officers thereof.

GENERAL CONDITIONS.

As the great object of the Society in rewarding individuals is to draw forth and give currency to those inventions and improvements, which are likely to benefit the public at large, candidates are requested to observe, that if the *means*, by which the respective objects are effected, do require an expense or trouble too great for *general purposes*, the Society will not consider itself as bound to give the offered *reward*; but, though it thus reserves the power of giving in all cases such part only of any premium as the performance shall be adjudged to deserve, or of withholding the whole if there be no merit, yet the candidates may be assured the Society will always judge liberally of their several claims.

It is required, that the matters for which premiums are offered, be delivered in without names, or any intimation to whom they belong; that each particular thing be marked in what manner each claimant thinks fit, such claimant sending with it a paper sealed up, having on the outside a corresponding mark, and on the inside, the claimant's name and address; and all candidates are to take notice, that no claim for a premium will be attended to, unless the conditions of the advertisement are fully complied with.

No papers shall be opened, but such as shall gain premiums, unless where it appears to the Society absolutely necessary for the determination of the claim; all the rest shall be returned unopened with the matters to which they belong, if inquired after by the mark within two years.

All models of machines, which obtain premiums or bounties, shall be the property of the Society; and, where a premium or bounty is given for any machine, a perfect model thereof shall be given to the Society.

All the premiums of this Society are designed for Great-Britain and Ireland, unless expressly mentioned to the contrary.

The claims shall be determined as soon as possible after the delivery of the specimens.

It is expected that all articles for claims or bounties be sent to the Society carriage paid.

No person shall receive any premium, bounty, or encouragement, from the Society for any matter for which he has obtained, or purposes to obtain, a patent.

A candidate for a premium, or a person applying for a bounty, being detected in any disingenuous method to impose on the Society, shall forfeit such bounty, and be deemed incapable of obtaining any for the future.

No member of this Society shall be a candidate for, or entitled to receive any premium, bounty, or reward, whatsoever, except the honorary medal of the Society. The candidates are, in all cases, expected to furnish a particular account of the subject of their claims; and where certificates are required to be produced in claim of premiums, they should be expressed, as nearly as possible, in the words of the respective advertisements, and be signed by persons who have a positive knowledge of the facts stated.

Where premiums or bounties are obtained in consequence of specimens produced, the Society

mean to retain such part of those specimens as they may judge necessary, making a reasonable allowance for the same.

No candidates shall be present at any meetings of the Society or committees, or admitted at the Society's rooms, after they have delivered in their claims, until such claims are adjudged, unless summoned by the committee.

N. B. The Society farther invite the communications of scientific and practical men upon any of the subjects for which premiums are offered, although their experiments may have been conducted upon a smaller scale than the terms of each require, as they may afford ground for more extensive application, and thus materially forward the views of the Society, and contribute to the advantage of the public. Such communications to be made by letter, addressed to the Society, and directed to Mr. CHARLES TAYLOR, the Secretary, *at the Society of Arts, Adelphi, London.*

The models required by the Society should be upon the scale of one inch to a foot. The Winchester bushel is the measure referred to for grain; and, as the acres of different districts vary in extent, it is necessary to observe, that the Society mean Statute Acres of five and a half yards to the rod or pole, when acres are mentioned in their list of premiums; and they request that all communications to them may be made agreeably thereto.

The Society desire that the Papers on different subjects sent to them may be full, clear, explicit, fit for publication, and rather in the form of Essays than of Letters; and where descriptive Drawings can be conveniently sent, with the Models and Machines laid before the Society, is is recommended to be done.

Presents to the Society of Books for their Library will be thankfully received.

*** To persons inclined to leave a sum of money to this Society by will, the following form is offered for that purpose.

Item. I give and bequeath to A. B. and C. D. the sum of upon condition, and to the intent that they, or one of them, do pay the same to the Collector for the time being, of a Society in London, who now call themselves the Society for the Encouragement of Arts, Manufactures, and Commerce; which said sum of
I will and desire may be paid out of my personal estate, and applied towards the carrying on the laudable designs of the Society. By Order of the Society.

CHARLES TAYLOR, *Secretary.*

N. B. *The Society for the Encouragement of Arts, &c. considering that it would be beneficial to the Commerce of the United Kingdom, to bring the British Marbles into more general use, and that the most effectual method of accomplishing their object, would be,* for the present, *to make them more generally known in the capital, have come to the following resolutions:*—

Resolved,—That specimens of British Marbles be exposed in the Society's Rooms at the Adelphi for the inspection of the Public, under the following regulations:

1st, That all specimens be exact to a given size, *viz.* eight inches high, six inches broad, one inch thick, and polished on one face.

2d, That a book be kept containing the number of each specimen, and describing the situation of the quarry, the name of the parish where situated, the distance of the quarry from a beaten road, and the distance of that road from water-carriage, with the name of the donor and proprietor. Any remarks on the qualities of the marbles, or on the lime produced from them, will be gratefully received and preserved by the Society, as materials for future inquiries.

Resolved,—That as the exertions of the Society can only be beneficial to the public, inasmuch as their views are seconded by the public, the Society request, that all persons proprietors of marble quarries will favour them with a specimen of the marble, worked to the exact size above mentioned, with the description of the quarry as above, that the same may be entered in the book to be preserved for the use of the public.

PAPERS

IN

AGRICULTURE.

AGRICULTURE.

THE GOLD MEDAL of the Society was this Session adjudged to JOHN CHRISTIAN CURWEN, Esq. M.P. of Belle-isle, on Winandermere Lake, between Westmoreland and Lancashire, for his PLANTATIONS of TIMBER TREES. The following ACCOUNTS and CERTIFICATES were received from him.

SIR,

I HAVE the pleasure of transmitting to you herewith Certificates from the Nursery-men who supplied me with trees for my Plantings, between October, 1800, and April, 1801; also, Certificates from the persons who superintended the different Plantations; and Attestations of the Trees being in a flourishing condition, and perfectly well fenced.

I am highly sensible of the favours already received from the Society. The efforts I have made, and shall continue to make, are the best proofs I can give of the value and estimation in which I hold them, and how ambitious I am of being still farther indebted to them. I shall be highly gratified, should I be successful in the present instance, for any of the Premiums of the Society.

The quantities planted by me, between October, 1800, and April, 1801, are as follow:

Oak	271,420	Brought forward	773,416
Larch	229,476	Birch	21,540
Ash	240,800	Alders	10,000
Scotch Fir	23,600	Elm	10,000
Beech	8,120		
	773,416		814,956

I also transmit you Certificates of the quantity of ground planted with Osiers at Workington.

Encouraged by the wishes of the Society, I beg leave to submit a few observations I have made in the course of my

my planting. From the difficulty of getting transplanted Larches, I was induced to try two years seedlings, which I have found to answer extremely well; fewer plants are lost, and the saving in expense is one half. I have applied the thinnings of my Larch Plantations, of sixteen years growth, for railing for waggon-roads, and find them to answer. The trees square from 5 inches to $4\frac{1}{2}$, and are not much inferior to Oak of twice that age. To try the durability of Larch, I have built a new boat of it; the plank about forty years growth, the timbers sixteen. I have also made one of the best Oak of the country. I am sanguine in my expectations that the Larch will not prove inferior to the Oak. The upper strata, or soil, does not appear to contribute any thing to the growth of the Larch, at least in such strata as mine (a gravel). I was led to this opinion from the progress made by some Larch planted upon a road

which had been changed; and, wanting soil, I stripped a whole acre, and then planted it in this state with Larch; and also as much adjoining land on soil not removed. I do not perceive there is any difference in the plants; they appear equally thriving. This may, in some instances, be a convenience in ornamental plantings.

The large quantities of Ash which I have planted with the Oak, is with a view of cutting them for underwood. I question if there be any thing so profitable. The demand for hoops has within twenty years doubled the value of the woods in this neighbourhood. There are acres of wood, which, at fifteen years growth, will leave a clear profit of forty-five pounds. Supposing this to proceed for ninety years, with interest, the acre would produce £815; four times, I should suppose, the amount of the best acre of Oak in the kingdom.

The

The Osiers are to supply the place of the Hazel, in making coal-baskets for my Coal Works. I do not know whether it has ever been tried; but should it answer, it will be of great service.

My Larch Plantations are making a rapid progress; and in a few years the thinnings will become of considerable value. The Oak from the Acorn does not generally answer.

I have the honour to be,
SIR,
Your obedient humble Servant,
J. C. CURWEN.

The above letter was accompanied with the following certificates, viz. from Messrs. Cook and Atkinson, of Keswick, dated April 4, 1803,—stating, that they have supplied Mr. Curwen, between October, 1800, and March, 1801, with 1600 Larch, and 2100 Beech

trees, and that they now appear in a thriving condition at Belle Grange.

From Messrs. Archibald Dickson, jun. and Co. of Hassendeanburn,—stating, they had supplied, between October, 1800, and March, 1801, inclusive, 19,500 transplanted Larch trees; and in March and April, 1802, 3000 transplanted Larches, and 10,000 two years seedling Larch, at Workington.

From Mr. William Thompson, at Pickhill, near Bedale,—stating, he had supplied, between October, 1800, and March, 1801, 40,000 Larches, which appear in a thriving condition, at Belle Grange.

From Messrs. Archibald Dickson and Sons,—that they had supplied 44,800 seedling Larches, in 1799; and a certificate from Mr. William Turnbull, gardener, at Workington,—that he planted for Mr. Curwen the principal part of the above Larches at Workington,

ton, and that the remainder were sent to Winandermere, dated June 25, 1803. Likewise, from Mr. William Slee, dated June 20, 1803,—stating, he planted the remainder for Mr. Curwen.

From Mr. John Dover, of Roger-scales,—stating, that he had furnished, between October, 1800, and April, 1801, 9856 trees of several sorts; and a certificate from William Unwin, gardener to Mr. Curwen,—that he had planted the said trees between October, 1800, and April, 1801.

From Mr. William Slee,—stating, he had supplied, between October, 1800, and March, 1801, to Mr. Curwen's sundry plantations at Workington, Belle Grange, and Ewanrig, 702,000 trees, consisting of Oak, Larch, Scotch Fir, Elm, Birch, Beech, Alder, and Ash.

The certificate likewise states, that he had conducted the planting of the trees furnished by Saunders, Thompson, Clark, and Atkinson, and the

Oaks

Oaks furnished by Saunders; that *the whole plantations extended over three hundred acres and upwards*, part of which had failed with acorns; that he also planted the Larches received from Workington; and that the whole is fenced with a six-feet wall, and was in a thriving condition on the 30th of June, 1803.

From Mr. J. Johnson, dated Ewanrig Hall, July 4, 1803,—stating, that the Larches planted at Ewanrig Hall, in October, 1800, and April, 1801, were in a thriving condition, and well protected by a thorn fence and railing: also from the Rev. H. J. Marke, confirming the above.

From the Rev. Peter How, dated June 27, 1803,—stating, that he had viewed the plantations at Workington and Harrington, planted between October, 1800, and April, 1801, containing between 30 and 40 acres; that they are in a flourishing condition, and well fenced;

fenced; that he had also viewed the two plantations of Osiers, which are healthy, well fenced, and watered.

From Mr. John Gash, Land Surveyor, —testifying that the Willow plantations in Workington are 4 statute acres, 19 perches, and are in a thriving condition.

From the Rev. Reginald Brathwaite, Minister of Hawkshead, dated July 26, 1803,—stating, that he had viewed the plantations beyond Belle-isle; that the trees are in a flourishing condition, and perfectly secured by stone walls; and that the Larches growing on the spot where the soil had been removed, were apparently as healthy as the others.

An explanatory letter was also received from J. C. Curwen, Esq. dated December 5, 1803,—stating, that a large quantity of the Oak and Ash were planted in the Heald, near Winandermere, containing 220 acres, on land which had been previously sown with Acorns, but which had failed; that 80 acres

were

were entirely planted afresh; and when Oak and Ash were used, 6000 were planted on an acre. The Larch, one in each square yard, or 4600 per acre. The soil was in general a light loam, with rock underneath, near the surface. That in planting at Winandermere, he used hacks pointed at one end, and about $3\frac{1}{2}$ inches broad at the other; finding this implement to answer much better in making the holes for the plants. The ground at Workington is upwards of thirty acres; at Ewanrig three. That the soil being strong clay, and very wet, he had made open drains to take off the water, and opened the pits with a spade. That, as both places were exposed to the sea, he had planted them with Larches; that by having the same growth, they do not overtop each other; and that he finds this to answer an admirable purpose, and can recommend it from the experience of nearly thirty years.

In

In those spots where he has planted the Scotch Fir, they are all of the same kind; he has never attempted to use them as screens. That when the water is completely taken from the roots of trees, he believes they will bear any storm, provided it be not a current of air, which he sees, in all instances, is most injurious to trees, and difficult to overcome.

The Osier ground is strong clay; he has planted them on ridges, with a good ditch on each side, and laid up the best of the soil. The water can be let in at pleasure. In winter, he keeps them dry; and early in the spring, shuts in the water.

That the Larches near the Ferry, planted on a gravelly hill, whence the soil had been previously removed, were as thriving as those planted in other parts, where the soil had not been removed.

The

The GOLD MEDAL of the Society was this Session adjudged to J. ARTHUR BORRON, Esq. of Warrington, in Lancashire, for his PLANTATION of OSIERS; from whom the following ACCOUNTS and CERTIFICATES were received.

SIR,

I BEG leave to transmit to you the following claim to the honorary Medal of the Society, which I find is continued to be offered for the present year, for the planting of Osiers. Being possessed of a piece of land, which, from its great depth of soil and moistness, appeared proper for their growth, I caused it, last spring, to be pared with a plough, and trenched by the spade, sixteen inches deep, in beds of $7\frac{1}{2}$ feet in width. It was afterwards planted, in the months of February, March, and April,

April, with the large white Osier, Spanish, and new kinds. The whole of the land planted is, by an accurate admeasurement, exclusive of the fences, 34 acres, 1 rood, 20 perches, statute measure. The number of plants was upwards of 600,000. They are now in a flourishing state, some of them eleven feet high, notwithstanding the unusual dryness of the summer, of which you have a proper certificate.

Perhaps it may not be unimportant, or foreign to the views of the Society, to state a method I have taken to insure their future welfare, as it may tend to the application of it to other plants of similar habits, which are not at present cultivated in this kingdom. Through the middle of the land flowed a brook, which was almost constantly level with a great part of the land, and which rendered it unhealthy for vegetation. By taking the water on a higher level, up the stream, and afterwards

wards dividing it, so as to encircle the plantation, and finally discharging it, when not wanted, at the farthest end, above 1000 yards distant, the following objects were gained :—First, a part of the bed of the old brook served as a complete drain for the whole.—Secondly, the new courses formed, with a quickset, an excellent fence for the plantation ; and, by means of flood-gates at the farthest junction, the water is thrown at pleasure, the hottest day in summer, between the beds of Osiers ; the divisions between which are 20 inches wide, and 16 deep, clean shovelled out. These are in an horizontal direction, and nearly level. They are intersected by a water-course at right angles, from the highest to the lowest part of the ground, communicating at the top with the brook, which, when introduced, is thrown to any height, by small stops in the divisions : when these are removed, it serves

as

as a drain.—Thirdly, the difference of land gained by almost filling up the old brook, and the space occupied by the new ones, is nearly two acres. It will be observed that, by this method, which perhaps I might call Egyptian, I can give the plants, at all times, that proportion of moisture, when they most want it, and which is most congenial to their growth; and in winter, except in high floods, they may have that dryness which is as necessary to their health. This mode is well known, as applied to floating meadows; but I believe is novel in every other application. If I have been too prolix, or taken up too much attention on this subject, I shall hope to be excused.

I am, SIR,

Your most obedient Servant,

J. A. BORRON.

Warrington, Nov. 21, 1803.

CHARLES TAYLOR, Esq.

Two Certificates accompanied this letter: one from the Rev. Johnson Grant, Curate of Warrington; and the other from Mr. John Curwen, Bailiff to Mr. Borron, stating, that J. A. Borron, Esq. had planted, in the months of February, March, and April last, nearly thirty-five acres of land, with upwards of six hundred thousand Osier plants, of the new kind, Spanish and White Osier, there not being less than 20,000 plants on each acre; and that the same are properly fenced, and are now in a thriving condition.

The

The GOLD MEDAL of the Society was this Session voted to THOMAS PLOWMAN, Esq. of Broome, in Norfolk, for an improved SHEEPFOLD; from whom the following Accounts and Certificates were received; and to which an Engraving on Wood, and Description, are annexed.

SIR,

WITH this you will receive a Model of a Sheepfold, invented by me, on an improved and very simple principle, combining many advantages over the old and expensive method of folding by hurdles; and as the whole Fold can be removed with ease at all times, it will be found peculiarly useful in feeding off turnips on the land in frosty weather, when hurdles cannot be used; and, as the saving of labour in Agriculture is a leading object, I

have no doubt of seeing it, in a very few years, generally adopted.

The expense, in the first instance, will exceed that of hurdles, for the same given quantity of sheep; but having had one in use nearly three years, I am satisfied the saving will be very considerable: for, before I adopted this method of folding, I lost from thirty to forty nights folding in the year, owing to the land being hard in dry seasons, such as the two last; which renders folding almost impracticable, as they never can be set without great labour and destruction of hurdles. I am also clearly of opinion, that the stock of sheep will be greatly increased when this method of folding becomes more known; and that it will enable many small farmers to keep from 50 to 100 sheep, who now are deterred from it, on account of the small quantity of feed they have, not answering to keep a man for that purpose only; but

but by this plan, they may keep a boy at 3s. or 3s. 6d. per week, who can attend on 100 or 200 sheep, and move the fold himself without any assistance. In heavy gales of wind it frequently happens that hurdles are blown down, and the sheep, of course, being at liberty to range over the crops, do incalculable mischief; which cannot happen with my fold.

In some counties in England, where hogs are folded, great difficulties are experienced for want of stowage, for them to feed off winter tares, &c. &c. as they root up every stake or hurdle; and having tried the experiment, I am certain my fold will keep them in, and defy their attempts to displace it.

I have inclosed a drawing, which you will find to correspond with the model, and a description, by which you will see what an astonishing quantity of time is saved, when a man can remove a fold to contain 300 sheep in five mi-

nutes, which, by the old method, frequently takes some hours to accomplish.

I have also enclosed a Certificate of gentlemen, who are now using folds from my model; and I have the honour to add the testimony of his Grace the Duke of Bedford in its favour, for whom I have a Sheepfold now making.

If this Fold should appear to the Society to possess the merit which I think it does, I shall be happy to receive any honorary mark of distinction they may please to confer on,

SIR,

Your very obedient Servant,

THOS. PLOWMAN.

Broome, Norfolk,
March 28, 1804.

CHAS. TAYLOR, Esq.

DE-

Mr. Plowman's Improved Sheep Fold.

Fig 4

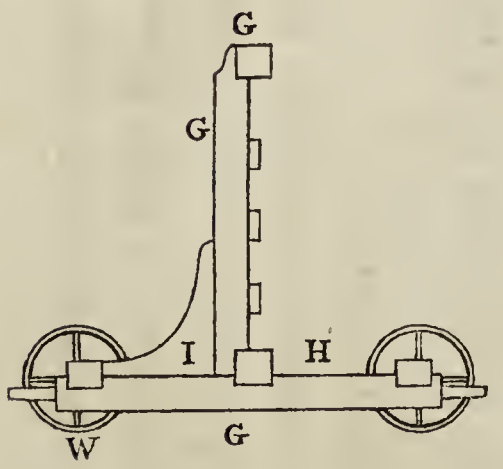


Fig 2

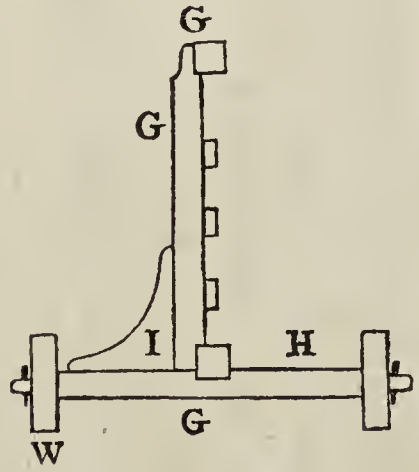


Fig 3

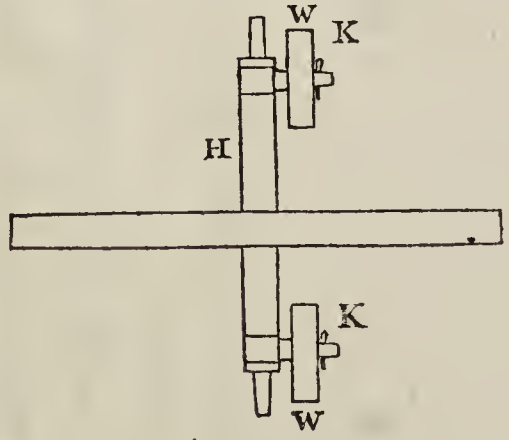
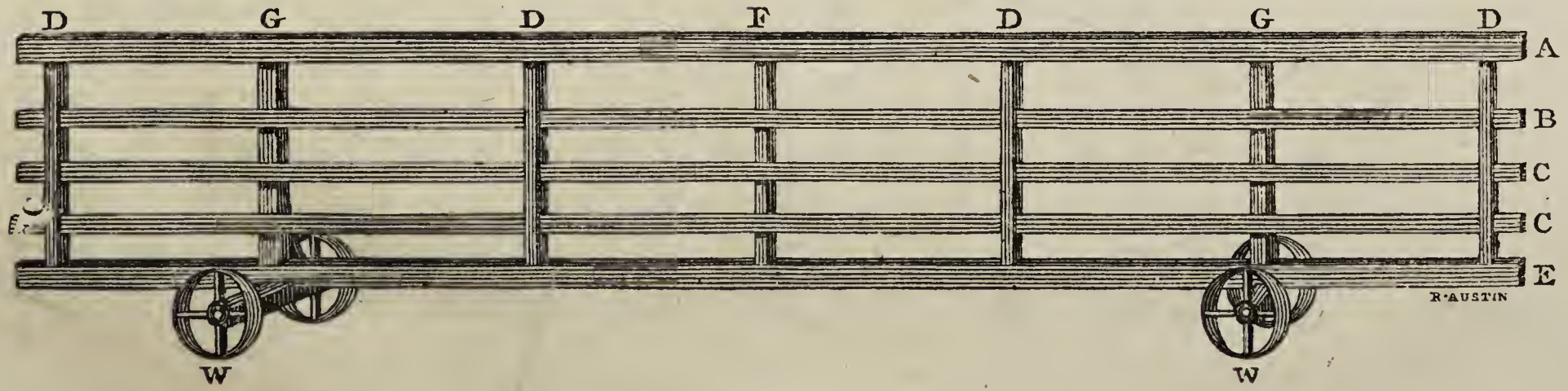
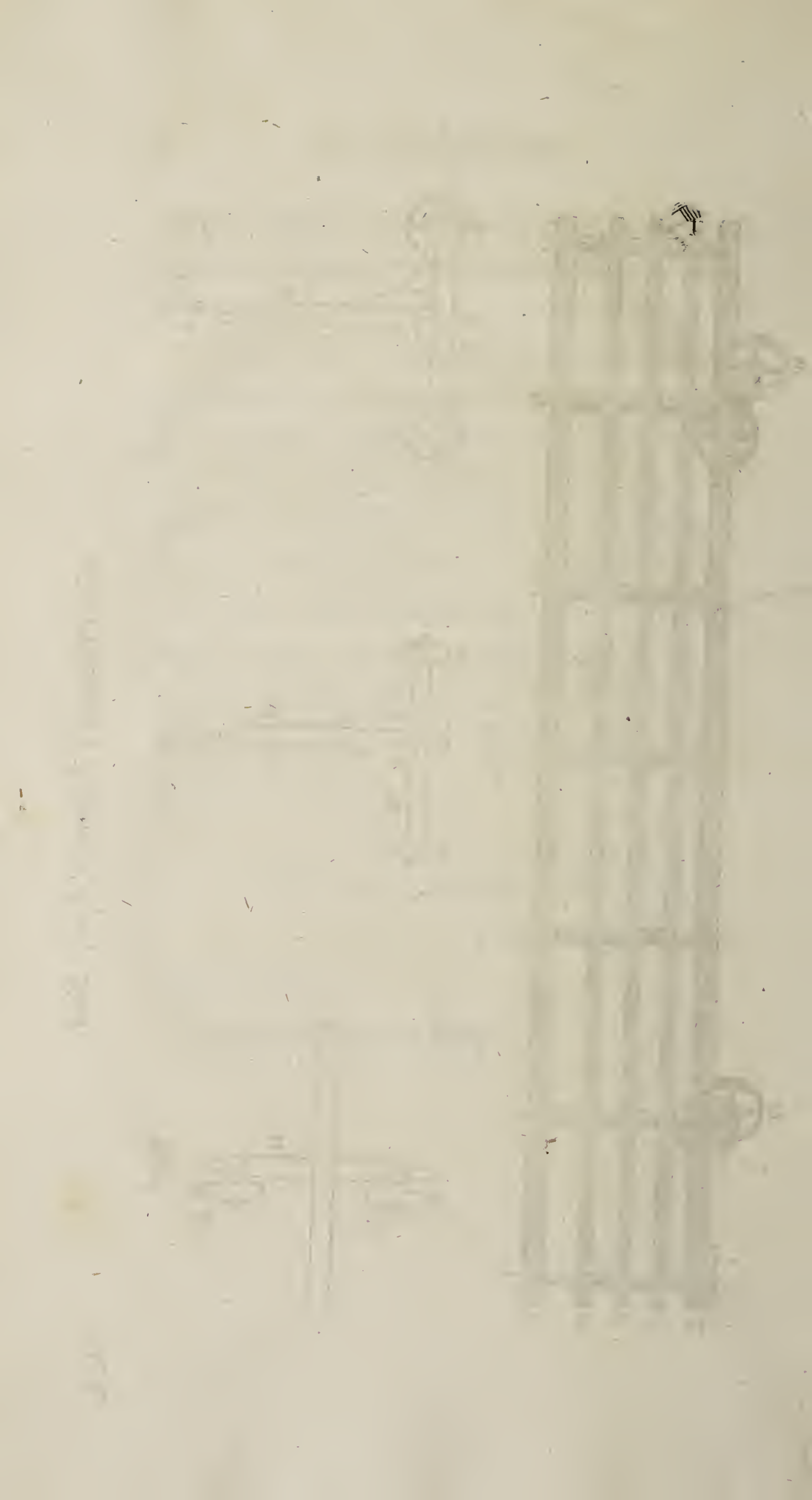


Fig 1





DESCRIPTION *of a* SHEEPFOLD *invented by Mr.* THOMAS PLOWMAN, *of Broome, in Norfolk, which one man may remove with ease in five minutes, though large enough to hold* 300 *Sheep.*

Fig. I. Twenty-one feet long, and three feet eleven inches high, composed of a top rail.

A, Three inches deep and two inches thick.

B, The upper bar, three inches deep, and three-quarters inch thick.

C C, The two lower bars, four inches by three-quarters of an inch, which, with the upper bar, are morticed through the uprights.

D D D D, Which uprights are oak, three inches by two inches.

E, The lower bar, three inches by three.

F, An upright bar, with the horizontal bars halved into it.

G G, Two oak uprights, three by two inches.

Fig. II. Shows the oak uprights G G.

H, The axletree, three inches by three, and three feet between the wheels.

I, An oak knee, which connects the uprights G G with the axletree, by means of two screws and nuts.

Fig. III. A plan, in which the axle H is shown with two arms K K at right angles to H, which are made to act as pivots to the wheels, when intended to be moved in a direction at right angles to the bars.

Fig. IV. Is a view of the same parts described in *Fig.* 3.

The wheels marked W, in all the figures, are of cast iron, and cost 3s. 6d. each.

SIR,

SIR,

IN answer to your favour of the 16th instant, I have the honour to inform you that, where the Fold is wanted to be used on very hilly ground, you must begin at the top, and work it down to the bottom, for the ease of removing it, and then draw it up again with a horse. This, however, I have never had occasion to do; for the land with us is ploughed in a contrary direction, and we work the Fold in the same course as the ridges. By this mean, the inconvenience is avoided of crossing the furrows, and they are also a guide to keep the Fold in a strait direction.

With respect to the sheep getting under, I do not recollect that circumstance to have ever happened, nor do I conceive that any land, which is cultivated

vated can be so uneven as to admit of it.

I remain, SIR,

Your most obedient Servant,

THOMAS PLOWMAN.

Broome, May 26,
1804.

CHAS. TAYLOR, Esq.

Satisfactory Certificates accompanied the above Papers;—stating, that the Sheepfold fully answers the purpose intended; and that it is a very valuable improvement.

The

The GOLD MEDAL of the Society was this Session voted to JOHN CHRISTIAN CURWEN, Esq. M.P. of Workington-Hall, in Cumberland, for his Experiments in draining Land; from whom the following Account and Certificates were received, and to which an Engraving on Wood and Description are annexed.

The Letter was accompanied with a Plan, which may be seen by application at the Society's Rooms.

DEAR SIR,

MUCH having been said, in the public Papers, relative to Draining, on the improved method of Mr. Elkington, I beg leave to offer you some observations respecting it, which have fallen under my notice, and which tend to prove it can be applied, with success only, in such parts of the kingdom,

dom, as have few, if any, interruption of the strata. In order to make myself intelligible, it may not be improper to explain what is meant by interruptions of the strata, or dykes and fissures, as they are denominated in mining countries. They are produced by the fracture or disunion of the strata, and consist most commonly of the broken fragments of each superior strata; and towards the surface are of sand, gravel, and stones, which seldom or never fail of affording considerable quantities of water. These dykes may be approached within a few feet, and afford no water, as will be seen in two instances in the plan sent you. No. 3 is a main drain, four feet deep, which passed within a few yards of A, an extreme wet place, and did not affect it. The person employed, supposed the water to be below him, and brought in a lower level No. 1, which likewise failed. No. 2 was then made still lower, but with no better success

success than No. 3, though with more advantage of level. As soon as it crossed the dyke, I C, but before the level was brought up, not being deeper than the main drain, it got a considerable feeder. This proved that an interruption in the strata prevented the water flowing into a drain, which was of a depth otherwise to have drawn it. Another example occurs in the same field, at letter B; which is a sunk fence, four feet below the surface of the adjoining field, which was extremely wet within a few yards of the sunk fence. A lower level was supposed necessary to drain this water, and it was obtained at the dotted line. No water of any consequence was got, till it was within a few yards of the sunk fence, when a prodigious feeder was cut, and the head of the drain was not so deep at the time as the sunk fence. Many instances to the same effect might be produced. In sinking shafts in places much troubled with

with water, it is endeavoured, if circumstances will permit, to get near a dyke, which serves as a barrier to the water; and if, in sinking, the dyke be not crossed, the water is kept clear off; but if otherwise, the water would be got at any depth, though not in such quantities as when near the surface. The spot of ground, to which I have alluded, has above a dozen dykes, which may be traced from the out-bursts of water. They run in a direction of South to North-West. I have made my drains East and West. In one or two places, I was obliged to run a drain South. This proceeds from an arm running from the dyke: but this seldom extends to any distance, and they gradually decrease till they end; and they rather make an interruption than a breakage of the strata, as the strata is the same on each side of it. In such a country, Mr. Elkington could draw no more water than what lay in the uninterrupted strata between any

two

two of these dykes. The method of making the drain is explained by the Wood Engraving. I had twenty years ago drained this ground with stone drains, from 20 inches to two feet; but their direction having been mostly from North to South, and not sufficiently deep, I had got little more than the day water. The feeder which I have now got, might be made applicable to many purposes. The drains are from two feet to nearly five feet deep. I have made 6000 yards in the last twelve months; the cutting from 14d. to 18d. per rod, filling 8d. ten and a half single cart-loads of stones, at 9d. each, making the cost 10s. per rod. The expense appears great; but fewer drains are required, and the work is effectually done. By reference to the plan, it will be seen that the direction of the drains not being able to draw the upper water, I was obliged to extend them. I would advise beginning at the highest level; for frequently that clears the whole, unless

some

some dykes intervene in a contrary direction. I believe that all springs and out-bursts of water proceed from dykes. The extent of these is various. Some may be traced for many miles, and their effects seen from the water that appears on the surface. Their origin is scarcely perceptible, and they thicken to many yards as they are approached. The strata on both sides have a more rapid rise or dip, and are of a closer and harder texture. If these observations appear to you worthy of attention, you may make what use you think proper of them. I by no means wish to detract from Mr. Elkington's merit: but it is not generally applicable; and in counties where the strata are much broken, Mr. Elkington's plan will be found to fail.

I am, dear Sir,

Your obedient Servant,

Feb. 3, 1804. J. C. CURWEN.

Mr. CHARLES TAYLOR.

P.S. The highest drain is 120 feet above the level of No. 3.

A Cer-

A Certificate from Mr. William Hoodless, farming agent, accompanied this letter,—stating, that upwards of six thousand yards of Drains had been cut, and completely filled, on the farm of of John Christian Curwen, Esq.;—that the first drains made according to that plan were done three years ago; and that they stand completely, and answer an admirable purpose.

REFERENCE *to the Wood Engraving, of the manner in which Mr.* CURWEN'S *Drains are made.*

The lowest part of the Drain below E E is twelve inches wide.

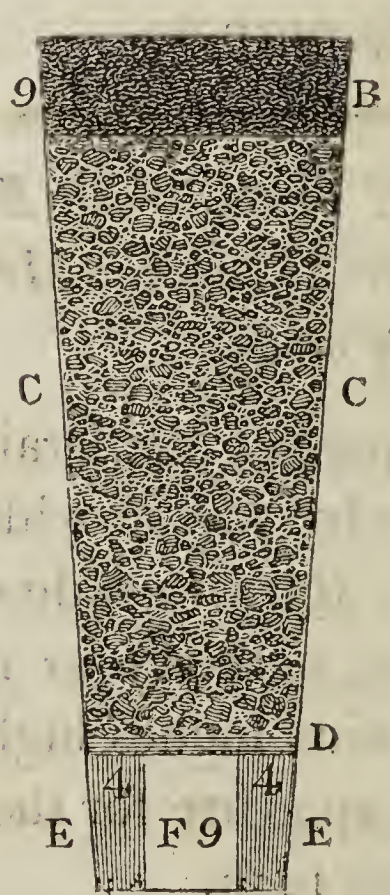
E E 4 4 are the two side stones of the Drain, nearly four inches thick, and nine inches high.

F 9 is the aperture for the water, nine inches high.

D, The flag or thin stone over the aperture, and which covers the side stones of the Drain.

C C, The body of the Drain, filled with loose stones, till within nine inches of the surface.

B 9, The top of the Drain, twenty-two inches wide, and nine inches deep, filled with grass sod and soil.



The

The SILVER MEDAL of the Society was this Session voted to JOHN HUTTON, Esq. of Marske, near Richmond, in Yorkshire, for his Plantations of Forest Trees; from whom the following ACCOUNT and CERTIFICATES were received.

SIR,

I BEG leave to offer myself as a Candidate for the Premium, Class 24, having enclosed and planted, between the 1st of October, 1799, and the 1st of May, 1801, nineteen acres, with forest trees.

The ground upon which the plantation is made, is upon a rapid declivity, with a north-east aspect, and but ill adapted to the operations of the plough, excepting a small part which has been in tillage previous to 1799. This part, prior to that period, bore crops of turnips, and

has clearly demonstrated the great advantage resulting from the cultivation of the soil, by the great luxuriance of growth of the trees planted upon it.

On some parts the trees have not flourished, owing to a scantiness of soil on a lime-stone rock, and to the naturally bad quality of soil, which produces nothing but bent grass, rushes, and short ling; and to the very great exposure to the north-west and west winds. In both those places, however, the defects of the first planting have been, in some degree, remedied, by planting in those situations such trees as were judged to be the best adapted to the respective qualities of the soil of each; in the former mountain ash; in the latter, alder and birch, with some few cuttings of the common willow.

The lower part of the plantation, planted by Bejamin Idle, was filled up with trees of a much larger size than were planted on any other part of the plantation.

plantation, and set at the distance of six feet from each other. They have not, however, thriven so well as the smaller ones; but are nevertheless alive, though making but slow progress.

The higher part of the land being much more exposed to the winds, I thought it advisable to plant it with considerably smaller trees, and at narrower intervals; and these trees clearly evince a superiority over the larger ones, by their more vigorous, healthy, and rapid growth.

The Certificates which I have herewith enclosed, will, I trust, give all the necessary information required.

I am, Sir,

Your obedient Servant,

JOHN HUTTON.

Marske, Jan. 25, 1804.

CHARLES TAYLOR, Esq.

THIS is to certify, that I planted, for John Hutton, Esq. of Marske, in the county of York, betwixt the 1st of October, 1799, and the 1st of April, 1801, five acres of land, with forest trees of the following description, viz. Oaks, 4236—Larch, 3059—Spruce Firs, 2607—Ashes, 3341—Beech, 575—Poplar and Birch, 424; and that they are at present in a healthy state, and properly secured by fences of stone and quickset hedges.

BENJAMIN IDLE, Gardener.

Marske, Jan. 25, 1804.

Signed in the presence of
FRANCIS RIDLEY, Churchwarden.

THIS

THIS is to certify, that I planted for John Hutton, Esq. of Marske, in the county of York, betwixt the 1st of October, 1799, and the 1st of April, 1801, fourteen acres of land, with trees of the following description, viz. Oak, 5400—Larch, 7300—Scotch Firs, 5700—Spruce Firs, 4500—Beech, 5200—Sycamore, 3500—Elms, 4500—Ashes, 5300—Birches, 1600—Alders, 2000—Mountain Ash, 2000—Silver Fir, 800; from one foot to two feet; and that the plantation is at present in a healthy state; and that the trees are properly fenced and secured from all depredations.

The method used by me in planting, was to take a sod out and invert it, and to put the trees in with a common setting-stick, as witness my hand,

THOMAS JACKSON.

Marske, Jan. 25, 1804.

Signed in the presence of
FRANCIS RIDLEY, Churchwarden.

The SILVER MEDAL and FIFTEEN GUINEAS were this Session voted to WILLIAM PEARCE, of Turf House, in the parish of Landewednack, near Helston, in Cornwall, for his unremitted industry in improving a quantity of Land, lying waste; from whom the following COMMUNICATION and CERTIFICATES were received.

This Letter was accompanied with a PLAN, which may be seen, by application at the Society's Rooms.

SIR,

TO apologize, when pleading in the cause of humanity and industry, would be an insult to the members of a liberal institution; I shall therefore only beg excuse for the style of my narration.

I yesterday took a walk of about two miles from this station, to satisfy myself

self respecting a remarkable instance of persevering and indefatigable industry, which I had heard of, and found as follows: Twelve acres of barren downs had been taken from the common, seven or eight of which were in a high state of cultivation, and the remainder in a very forward state of improvement. In order to vary, as needful, the different kinds of produce, this space was divided into eight different fields, which required seventeen fences, the greater part of which was made with stone, and put together in a masterly manner. But a great part of this industry is hid, for most of the downs being swampy ground, and some very shallow, in order to remove the first inconvenience, the different fields were obliged to be intersected with various drains, which empty themselves into the ditches that have been obliged to be dug round the margin of each field, both for this purpose, and in order to give

give greater height to the fences. On each side of every bank ditches are dug, and in the gateways bridges are made, able to support a loaded cart, that the water may freely run off. The land produced, in 1803, ten Cornish bushels of barley, nine trusses of hay, two hogsheads of oats, and ten bushels of wheat, besides pasture for cattle. This has been the work of eighteen years time, by one indefatigable man, who began it in the fiftieth year of his age. I have to add, that his dwelling-house and out-buildings, including the turf walls, of which they are composed, the laying of the rafters, and the thatching, are all executed by himself, though he was only bred to husbandry.

His industry is surprising, as, independent of his great labour in procuring manure from a distance which has required his travelling two hundred miles, he brings coals for different persons, of whom I am one. The distance

from

from me is eleven miles. He has brought coals so far on my account eight times, since last July, which add 176 miles more.

The ground he is improving is the property of Sir Christopher Hawkins; and, though labouring under a natural infirmity in the hand, which obliges him to conduct the plough with one hand only, yet he continues indefatigable in his exertions.

I am, Sir,

Your most obedient Servant,

THOS. HUMPHRIES,

Lieut. Royal Navy.

Lizard Signal Station, near Helston, in Cornwall.
Feb. 22, 1804.

CHAS. TAYLOR, Esq.

SIR,

SIR,

I BEG leave to lay before the Society for the Encouragement of Arts, &c. the following narration, hoping that though the extent of my improvements is not great, yet they will not be considered undeserving their notice, as it has been to me a most arduous undertaking, and has required my unceasing and indefatigable labour, and which it still requires. For a part of my manure only, which consists of sea sand, I have to go two miles; and my average annual quantity being 50 load, for this one article I must of course travel 200 miles, independent of my labour in loading and procuring it. What other labour is unavoidably necessary, in order to carry on the series of husbandry, needs no comment from me to your Society. I chiefly rest on my labour, for now upwards of eighteen years in this

this particular branch of agriculture, to recommend me to your Society, and as having added my mite towards the improvement of waste grounds. The manner of my proceeding I shall endeavour to make as plain as possible, for the information of others. I was induced to this undertaking from a great love of husbandry, a wish to serve my family, and a desire to employ myself in that part of agriculture, which I thought the most useful to my country, and beneficial to mankind.

I still find the same strong propensity in my mind: but my corporeal abilities fail me, being in my sixty-eighth year. If I could have kept a man all this time, I suppose I should have been able to have made four times the improvement I have, as the odds of an additional hand to one need not be mentioned to your Society. But, on the contrary, when I began, and for some years after, this, to me, arduous undertaking, I was obliged

liged to work for others five days out of the week, to obtain food for myself, a wife, and seven children, viz. six sons and one daughter; the former of which, as soon as able, went into the service of their country, in which two are now employed, and two lost their lives last war.

As to property, when I first began this undertaking, I had none, except one mare, and the shilling per day I earned by my labour, at which I used to work hard, in order to finish it as soon as possible; not to leave off work, but to go to still harder, that of my own undertaking in improvement.

The manner I proceeded in clearing the land, which was chiefly swamp, and produced what in general grows on those kind of commons, was as follows: the surface for the most part was less than six inches, under which was a bed of loose stones of various sizes, from half a pound to three cwt. or thereabouts, but

but the latter generally appeared above the surface. To clear away these, was certainly a work of great trouble; but still it assisted me in another respect, and on this account it was so far an advantage: for on removing these stones from their natural bed, they were carried to places in which they might be handy to face my banks, the extent and labour of which will be seen by the imperfect, though nearly correct, plan which accompanies this narrative, as I thought it might tend to throw more light on the subject, than my still more imperfect narrative. My method was first to enclose in part; to do which I was obliged to collect materials, that is, turfs and stones, as I could procure them; which cost me great labour. After which, when I came to clear away to improve the grounds, the stones, as before mentioned, did, by being used as I have said, separate my *extreme* enclosures, and divide the grounds into different

ferent departments, and assisted me in the two grand objects of clearing the ground and making the banks. As the plan is too small to give it in scale, it may be necessary here to mention, that the banks are between five and six feet high, and four feet broad, as I built them to be durable, and though not exactly so, still very nearly in as straight lines as drawn in the plan, having made them so, because for a variety of reasons they are more convenient.

In the spring, as the land became dry, I began to cut up the surface of the ground, exactly the same as turfs for fuel; which, being placed upright, with their upper ends touching, were left in this manner to dry. As soon as this was accomplished, they were placed in piles loosely together, and burnt. I then proceeded to clear under the surface the loose stones as mentioned; which on being removed, as before related, I came to a strata of rather light, loose

loose clay (there are some exceptions to this of not so good a bottom), among which at times stones were likewise found. For this reason it became necessary first to break all this ground up by hand, not being able to use the plough, which, when done to a convenient depth to answer the purposes of tillage, was manured with the before-mentioned burnt materials, to which at times something more was added. The corn was then sown, and turned in with the plough, wheat, oats, and barley in succession, with the latter of which grass-seed was sown. It was then suffered to lie fallow for three or four years, at the end of which time it was managed by the common methods of ploughing, harrowing, and manuring. This latter requires great labour, for the reasons above mentioned, before it is brought into a proper state for tillage. After this, a regular succession of different kinds of grain, fit to keep the ground in the best

state for cultivation, is carried on. After having improved as much as required my more immediate attendance, and the produce of which tended greatly towards the support of my family, I began to erect a dwelling on the spot, the walls of which are composed of turfs, the roof rafted and thatched by myself; to which has been added, as I was able, barn, stable, cart-house, and other convenient out-houses for my cattle, &c. which at present consists of three horses, and one cow rising five years, two heifers rising three and four years, two steers rising two years, and one yearling. To which may be added, as another part of my small stock, a few bushels of different kinds of grain, and a small quantity of hay, plough, harrow, cart, slide, wheel-barrows, &c. &c. of tools necessary for husband ry.

For the more particularly understanding the extent and nature of my enclosures, with the various kinds of tillage they

they are applied to at present, I hope the plan I have sent, though imperfect, will be found sufficient. I have effected the whole improvement by my industry; as, when I began it, I was worth no more than the mare before mentioned, and the shilling I had earned on the first day of my operations. I have a large swelling on my hand, which I was born with, and which extends from the middle joints of the fingers on the left hand to nearly the elbow. Though this has not rendered my hand quite useless, yet it is so in a great degree, as I cannot use my fingers to take off my clothes, but am obliged to be assisted; and within these last few years it gets worse; but still, thank God, it is of use to me in my more laborious calling.

I am, Sir, your obedient Servant,

WM. PEARCE.

C. TAYLOR, Esq.

THESE are to certify, that we verily believe the above to be a true statement, most of it coming under our own knowledge.

JAMES KEMPTHORNE, R. N.
THOMAS HUMPHRIS,
Lieutenant Royal Navy.

Landewednack, March 13, 1804.

The

The THANKS of the Society were this Session presented to Mr. CHARLES WAISTELL, of High Holborn, for his useful Communication on the CONSTRUCTION of FIELD GATES, of his invention.

The following ACCOUNT was received from him, and an ENGRAVING on WOOD and DESCRIPTION are annexed.

DEAR SIR,

THE various methods used in bracing common gates for fields, prove that not one of them is greatly superior to the rest; for, if it was, that method would have been generally adopted. Most gates are loaded with superfluous timber in some of their parts, and are constructed upon such bad principles, that they are frequently broken by their own weight, aided by

the concussion of the head against the falling-post; and this, long before any part of the wood has begun to decay. I have for some time given this subject considerable attention, being impressed with the idea, that if common gates could be constructed with less timber, and upon better principles, the saving of timber only would be of national importance; for we have many millions of gates to uphold in Britain, and their numbers are annually increasing. The result of my labours has been the plan which accompanies this letter. Gates made according to it, possess great strength, are very light, and of easy and simple construction. Although uniformity of appearance be not essential in a common gate, yet it is worth having when it can be obtained, as in this gate, without additional expense.

My Gate is made with short, and consequently less valuable, oak or ash timber, than those of the commonest con-

construction; its strength is much greater than any other gate made with a like quantity of timber, there being at four distant points between the head and the heel, two bars and a brace crossing each other: and I doubt not that it will be found proportionably more durable: it is, besides, very easy to construct, and requires less labour than most other common gates. Twenty-nine years ago I designed plans for ornamental gates, with semi-oval and semi-circular braces, and had them executed; the plans were sent to my friends in various distant parts of this kingdom, as also to Ireland; and I have the pleasure to observe, that they are become almost the only ornamental gate in many parts of England. The plans of them I never published, although they were prepared for engraving fifteen years ago; and I should be as indifferent about my present design, of a common field gate, if I did not

conceive that its publication would materially benefit the public; the introduction of this form being, I conceive, of some national importance, as timber has been lately greatly enhanced in price, and is rapidly on the advance.

This Gate was designed for the approach to a country residence; but for common purposes, the wicket on one hand, and the short length of rails on the other, may be omitted. I shall thank you, if you will have the goodness to lay my plan before your respectable Society, of which I have, for many years, had the honour to be a member. And should this plan be approved of, I may probably furnish some designs for Park Gates on an improved construction.

I am, dear Sir,
Your very humble Servant,
CHARLES WAISTELL.

March 22, 1803.

MR. CHARLES TAYLOR.

REFERENCE

Reference *to the* Engraving *of Mr.* Waistell's Gate.

DIMENSIONS.

The heel of the gate to be about	$3\frac{1}{2}$	inches square.
The head of ditto - - - -	$2\frac{1}{2}$	by 3 inches.
The top rail or bar - - -	$3\frac{1}{2}$	by $1\frac{1}{2}$ inches.
The bottom bar - - - -	$3\frac{1}{2}$	by $1\frac{1}{4}$ inches.
The bar in the middle of the gate	3	by $1\frac{1}{4}$ inches.
The other bars, and the 4 braces	$2\frac{1}{2}$	by $1\frac{1}{4}$ inches.

Observations on its Construction.

The head and heel of the gate may be of oak, and the bars and braces of fir. Narrow and thick bars, when braced as in this design, are stronger than broad and thin ones, containing the same quantity of timber, and they also oppose a less surface to the wind. The two points in the heel of the gate, to which the thimbles are fastened, may be considered as firm or fixed points. From these points, viz. 1 and 2, two braces to proceed to 4 and 3, in the middle

middle of the bottom and top bars, and being there secured, these become fixed points, and from these two points, viz. 4 and 3, two braces proceed to 5 and 6, fixing those points. The gate is thus doubly braced, viz. from the top of the heel to the top of the head, by means of the braces 1, 4, and 4, 5; and from the bottom of the heel to the bottom of the head, by means of the braces 2, 3, and 3, 6. On each side of the gate are two braces, and those parallel to each other. The brace proceeding from the bottom of the heel of the gate, and that which is parallel to it, as also the bottom bar, are all strained in the way of compression, and the brace proceeding from the top of the heel, and the other brace which is parallel to it, and also the top bar, are all strained in the way of extension. The strains in this Gate being none of them transverse, but all longitudinal, it would support a vast weight at its head without having its

form

form altered. The braces all serve the double purpose of keeping the gate in its true form, and of shortening the bearings of the bars, and strengthening them. Few gates have less timber in their braces; and perhaps in no other way can a gate be so firmly braced with so small a quantity of timber.

At 3, 4, 7, and 8, two braces and a bar of the gate are firmly screwed together by means of iron pins and screw nuts. At the other points, where only one brace crosses a bar, common gate-nails are used.

If, in some cases, a strong top-bar be wanted, to resist the pressure of heavy cattle, a bar or board, about six inches broad, and one inch thick, may be laid with its broad side upon the top bar, and fixed thereto by means of the ends of the braces in the middle, and by the heel and head of the gate at the two ends of it. This board will, in this position, resist exactly the same pressure

as

as a thick top bar, three inches broad, by four inches deep, although it contain no more than half the timber.

In the ground plan, or horizontal section, *Fig.* 7 represents a piece of wood, about four inches cube, pinned to the falling post, a little below the catch, to stop the gate from swinging beyond the post: another stop near the ground may be useful.

When gates are hung to open one way only, their heels and heads generally rest against the hanging and falling posts; but when they are hung according to this design, gates may be made about one foot shorter for the same opening, and consequently they must be lighter, stronger, and less expensive.

Of the hanging of Gates.

When the two hooks in the hanging-post are placed in the same perpendicular

cular line, a gate, like a door, will rest in any direction in which it may be placed. But, in order that a gate may shut itself when thrown open, the hooks are not placed exactly perpendicular; the upper hook declining a little towards the falling-post, or a few feet beyond it. In whatever direction that hook declines the farthest, in the same direction will the gate rest, if unobstructed, and its head cannot then sink any lower. Make the head describe half a circle, and it will thus have attained its utmost elevation, and will be equally inclined to descend either to the right or to the left *.

The following method of fixing the hooks and thimbles, will, I think, be found to answer very well for a gate that is intended to open only one way.

* See Chap. ii. of Mr. Parker's Essay on the Hanging of Gates; and also the Agricultural Report for Northumberland, by Messrs. Bailey and Culley.

Supposing

Supposing the face of the hanging-post to be set perpendicular, and the upper hook driven in near its inner angle, as is represented in the preceding design, and that the lower hook must be four feet and a half below it; suspend a plumb-line from the upper hook, and at four feet and a half mark the post; then at one inch and a half farther from the gateway than this mark, drive in the lower hook; this hook must project about half an inch farther from the face of the post than the upper hook. In the section or ground-plan of the gate, the two white circles near the hanging-post represent the places of the two hooks when brought to the same horizontal line; that nearest the gateway represents the place of the upper hook. A line drawn through the middle of these two circles, and extended each way, will, on one hand, represent the gate's natural line of rest, and, on the other, the line of its highest elevation.

A gate

A gate thus hung will, when thrown open nearly to the line of its highest elevation, return to the falling-post with a velocity sufficient to resist a moderately strong wind. This velocity will be either increased or diminished, accordingly as the upper hook declines more or less from a position perpendicular to the lower hook. In order to adapt the thimbles to these hooks;—as the lower hook is one inch and a half farther from the gateway than the upper hook, the lower thimble must have its eye an inch and a half farther from the heel of the gate than the eye of the upper thimble, in order that the bars of the gate may be in a horizontal position when it is shut. And, as the upper hook projects half an inch less from the hanging-post than the lower hook, the upper thimble should be fixed half an inch nearer the farther side of the heel of the gate than the lower thimble, in order that the gate may be in a perpendicular

pendicular position when shut. If the thimbles have straps embracing the heel of the gate, and proceeding a few inches along each side of the bottom and top bars, and if they are fixed to the heel bars and braces, by means of iron pins and screw nuts, great firmness will be given to the gate at those two points, which are those that suffer the greatest strains.

THIS is to certify, that I have constructed several Field Gates, after Mr. Waistell's plan. I approve of them beyond those after any other plan, and find them to answer well in use. All the field gates I have had made, these three or four years, have been after his plan. They take less timber, are less expensive, and are stronger and more durable than those made in the common way.

EDWARD SIMPSON,
Master of the Academy
at Woden Croft Lodge,
near Barnard-Castle.

July 20, 1803.

SIR,

I WAS favoured with your plan of a Gate some time ago, and, upon requesting your permission to insert it amongst the other collections preparing for a new edition of my pamphlet, I was informed by Mr. Kendal, that you proposed for it to appear, in the first instance, in the Reports of the Society for the Encouragement of Arts, &c. and mentioned, I think, the present month for its publication. I shall be very much obliged to you, if you can put me in the way of procuring a sight of your communication to that Society; and I have farther to request, that you would favour us with your wishes respecting the period, say two months or three months hence, at which I may consider myself at liberty to introduce your Gate amongst others in my pamphlet. I have completed four quarto

plates

plates, which are already engraved, and I shall add about two more. I was not at first aware that your pattern would have attracted my attention so much as it has done; but I find it extremely applicable to *cast metal hinges*, for which I have just sent the patterns to Birmingham; and I shall be very glad to forward a set of them to you, if you should think them worth your acceptance.

I am, SIR,
Your obedient Servant,
THOMAS N. PARKER.

Hatton Grange, near Shighall,
29th *May*, 1803.

Mr. WAISTELL,
No. 99, High Holborn.

The Thanks of the Society were this Session ordered to J. C. CURWEN, Esq. of Workington Hall, in Cumberland, for the present of a Model of his Machine for CLEANSING POTATOES, which is also applicable for washing Linen.

The following Communication was received from him, and the Model is preserved for public inspection in the Repository of the Society.

SIR,

IN order to elucidate more fully the advantages of feeding cattle with steamed potatoes, and to explain more clearly the manner of washing potatoes, I shall send to the Society a model of the machine I use for that purpose, and request the Society will accept it.

The

The following fact will confirm the plan I recommended to the Society last year, which was published in the 21st Volume of their Transactions, with explanatory Engravings. One farmer, who kept between fifty and sixty horses for my works, had a farm under me of four hundred acres, at £280 per ann.

Two years ago, when I first began with my potatoe-feed, he refused to pay the poor-rates, alledging his farm was too dear. Having prepared stabling, I gave him notice to quit his farm; and now within this week I have let it to him again, taking away two hundred acres, which were most commodious for the town, and reducing his rent £30 per annum, he now paying £250; and all I have to do, is to erect him an apparatus for steaming potatoes.

What I have taken from him, will bring me £300 per annum. The advantage of my plan will scarce be doubted, upon this statement. The im-

provement in the condition of my horses, since I began with the potatoe-feed, which is about three weeks, is astonishing. The potatoe-washer, I confidently trust, will be found of more general utility than I had any conception of, when I first constructed it. In the first which I made, brushes were attached to the barrel and the axle-trees, after it had been in use two years, washing for seven months in each year from 140 to 180 stones of potatoes *per diem*, each stone; and upon examination of it a few days ago, I was surprised to find the brushes scarce the worse for wear: this convinced me they had no share in the operation, and proved that the potatoes were washed solely by rolling over each other, and falling into the water.

Impressed with this notion, I conceived that the flanges attached to the axle-trees of washing-machines, and which are represented as doing so much mischief to linen in washing, as to prevent

vent them from being in general use, might be of as little utility in that operation as I had found my brushes. I lost no time in making the experiment, and had the satisfaction of finding it to answer completely, as the washing was perfectly effected without danger of injuring the clothes. I wish to record this through the medium of your patriotic Institution, to prevent any patent upon this plan.

I have the honour to be,

SIR,

Your obedient Servant,

J. C. CURWEN.

*** For the Drawings, and farther information on the Potatoe-Washer, see pages 203 and 206 of the 21st Vol. of the Society's Transactions.

The SILVER MEDAL of the Society was this Session voted to Mr. WILLIAM WATSON, of North Middleton, near Belford, in Northumberland, for the comparative CULTURE of TURNIPS, from whom the following COMMUNICATION and CERTIFICATES were received.

SIR,

HAVING been long, and pretty extensively employed in Agriculture, in a district where the turnip husbandry is much practised, and being satisfied that when the soil is proper, and the management judicious, great crops of that invaluable root are the most profitable means of obtaining luxuriant and productive crops of corn, &c. and of laying a solid foundation for future abundance in the increasing quantity of manure, I have paid particular attention

tention to the different modes pursued in its cultivation. It is with great pleasure, therefore, that in the list of premiums offered by the Society instituted at London for the Encouragement of Arts, &c.—a Society whose patriotic and laudable exertions deserve the most warm and grateful thanks of every real friend to the British empire,—I observe one for the best set of experiments made with a view of ascertaining the most advantageous of these modes; and, having made a comparative trial with great accuracy, I beg leave to request that you will do me the honour of laying this paper, which contains an account of it, before the Society. That there are situations in this kingdom in which eight acres of land may be found of an *uniform* quality, I do not doubt. I must, however, remark, that I never found that number of acres contiguous to each other, or properly situated, for an accurate comparative

parative experiment, in the fallow land of any farm in which I have been concerned, *so precisely similar in soil and condition*, as to induce me to think that I could have exhibited the result of so extensive an experiment as irrefragable evidence of the superiority of any particular mode of culture. Besides, I could not have attended either to the minute mixing of the necessary quantity of dung for eight acres of ground, *so as to have rendered it of an uniform quality*, nor to the weighing of *all* the turnips upon that quantity of land, without which, (when I adverted to the difference of weight occasioned even by a scarcely perceptible difference in the diameters of similiar solids) I could not have totally divested myself of some doubts as to the accuracy of the result.

For these reasons, I could not *satisfactorily* conduct the experiment on so large a scale as that proposed by the Society; and though I am thereby prevented

vented from becoming a candidate for the Medal,—a reward by which I should have considered myself highly honoured,—yet I hope this Communication will not be deemed altogether unimportant; and that it will, in some degree, forward the views of so distinguished a body.

Every part of the ground upon which this experiment was made, had been managed for a series of years, in exactly the same manner. After being three years in grass, it produced a crop of oats in 1802; in the autumn of which year it was once ploughed. In May and June following, it received three furrows in the common way, and was completely pulverized and cleaned; after which it was divided into four flat ridges, about eight yards broad, each ridge containing precisely 4719 square feet. The soil is a dry, light, sandy loam, mixed with small hard stones, incumbent on a thick substratum of gravel;

gravel; and the four ridges were so much alike in soil and condition, that I think I may assert, that the most accurate chemical operator could not have proved the smallest difference in these respects. On the 22d of June last, the ridge, No. 1, was manured with dung; immediately after which, the manure was regularly spread over it, and ploughed in. The whole ridge then received a single working, with a light short-tired harrow; and *while the moisture was fresh*, the turnip-seed was sown with a machine, in rows, upon a flat surface with thirteen inches intervals. About the same hour, the ridge, No. 2, was prepared and formed into small ridges, or drills, upon which the turnip-seed was deposited in rows, with a machine, twenty-six inches from each other. *The dung in about one third of the raised drills on this ridge was partly left without being completely covered in.*

Early

Early the next morning, the ridge, No. 3, was also formed into small ridges, or drills, with intervals of twenty-six inches. On the tops of these ridges, a proper machine quickly deposited the turnip-seed in single rows, precisely in the same mode as that pursued in No. 2. On this ridge, however, No. 3, *every atom* of the dung was carefully covered with the plough. Immediately after No. 3 was finished, No. 4 was dunged and sown with turnip-seed, in the usual manner, in the broad-cast method.—Every part of the four ridges was manured with dung of the same quality. It was not *thoroughly* rotten, but had arrived at a more advanced stage of putrefaction than that used by farmers in general; and, in order that its quality might be uniform, it was carefully taken from *one* part of the fold-yard, and well turned over, and mixed in the field.*

* Dung was the only manure applied.

An

An equal quantity was applied to each ridge, at the rate of fifteen two-horse cart-loads* per acre. The turnip-seed was likewise of the same quality and kind, and was sown on each ridge at the rate of about one pound and a half per acre. The succeeding weather was remarkably dry, and unfavourable for the growth of the turnips, only one light shower having fallen, from the time the seed was committed to the ground, to the 16th of September following.—Notwithstanding this, however, the whole of the four ridges planted exceedingly well, though not so early as I could have wished; and their progress into the rough leaf, as well as their appearance for some time afterwards, was propitious. From the extreme severity of the drought, however, and the natural dryness of the land, many of the plants

* The cart was five feet three inches long, three feet three inches broad, and one foot six inches high, in the inside.

in

in every ridge were killed. No. 1 lost the greatest quantity; No. 2 the next, *especially on those drills where the dung was not all completely covered in*; and No. 4 scarcely so many as No. 3.—Throughout the whole crop, vegetation seemed extremely languid, and the turnips were generally of a small size; the largest were produced on Nos. 2 and 3, *in the drills with intervals of 26 inches.* These intervals were twice horse-hoed, and their adjoining rows of plants were as often cleaned with the hand-hoe. In these rows the plants were left about eleven inches asunder. Numbers 1 and 4, in which the plants were set out at about twelve inches from each other, were thrice hand-hoed with great accuracy. The several operations of ploughing, sowing, and hoeing, were performed in the same kind of weather on each ridge. I attended the whole of them myself, and can safely say that the utmost precision and impartiality were observed.

observed. The four ridges were carefully surrounded with proper rails to prevent damage, and no depredations of any kind were committed.* On the first of this month, *all* the turnips which were produced on these ridges were drawn up, and carefully and exactly weighed, after their tops and tap, or fibrous roots, had been cut off. The produce of each ridge was as under:—

	stones.	*lbs.*	*lbs.*
No. 1, drilled on a flat surface, with intervals of 13 inches	144	10	—14 to the stone.
No. 2, drilled on small ridges, with intervals of 26 inches, and with a part of the dung not perfectly covered in	193	5	—ditto.
No. 3, drilled on small ridges, with intervals of 26 inches, and all the dung well covered in	211	4	—ditto.
No. 4, broad cast	168	12	—ditto.

* Except that a mole destroyed a few plants on three drills on No. 1.

Remarks

Remarks on the different Modes of Culture.

No. 1.

In this method of management the dung is applied in a manner exactly similar to that practised in the broadcast husbandry; and experienced agriculturists well know, that *even after it has been thoroughly putrefied*, it cannot be *wholly* covered by the earth in the mode of ploughing, pursued under that system of cultivation. In almost all cases, the harrows are used to produce an even surface after the last ploughing, and immediately before the seed is committed to the ground. By this operation more of the dung is left upon the surface; and when it is considered that much of it is applied in a long or half-rotten state, it will readily be conceived, that a still greater quantity will be left exposed on the surface of the ground;

in which situation it can conduce but little, if any thing, to increase its fertility.

Under this mode of management, the plants may be left at more regular distances in hoeing than in the broad-cast method; but I am *now* inclined to dispute that that operation can be performed at an expense materially, if at all, less than among those obtained in the latter way. The plants are generally left in the rows at about twelve inches apart, so that an acre will produce about 40,200 turnips, when the crop is a full one.

Nos. 2 and 3.

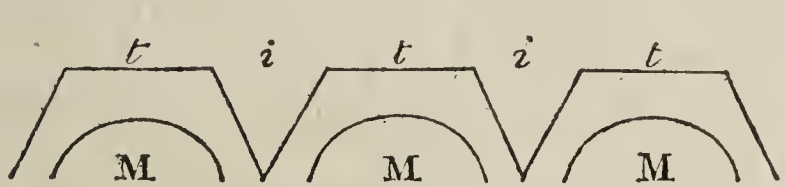
Some practical agriculturists, as well as chemical philosophers, have contended, that dung should be *thoroughly* putrefied before it be applied to the soil; and others maintain, that it is more

more beneficial to apply it in a half-rotten state. Into this dispute, I am not, at present, inclined to enter. Let it suffice to say, that a great majority, probably upwards of three-fourths of the farmers, in almost all the extensive turnip districts in the kingdom, apply it either in the latter state, or before it has arrived at a much more forward stage of putrefaction; and if rotten dung (thoroughly putrefied) cannot be *wholly* covered in this common mode of ploughing, it is obvious, as I have before remarked, that, in the other state, a still greater part must be rendered nearly useless by exposure to the solar rays, &c. In the management now under consideration, however, every atom of it may be buried, if the spreaders and ploughmen are attentive. That management is as follows: As soon as the land has been properly pulverized and cleaned, a double-mould board plough,

drawn by two horses, is used to raise small ridges in this form:

i, *i*, *i*, being intervals of twenty-six inches, and *t*, *t*, *t*, the tops, of about an inch or two broad. All the drills should be equal in size. The height is generally from about 12 to 15 inches: this, however, should in some measure be regulated by the quantity and state of the dung. Immediately after the small ridges or drills are formed, a man with a cart, drawn by one or two horses, lays a sufficient quantity of dung for three or five drills (in small heaps), in the interval I, while the wheels of the cart run in the adjoining spaces, *i*, *i*. In this manner all the other intervals are manured. As soon as the dung is carefully spread in the bottoms of the intervals, another double-mould board plough (also

(also drawn by two horses moving in the intervals), splits the ridges along the lines *t*, *t*, *t*. This operation completely covers the *whole* of the dung, and reverses the tops and intervals. A roller about ten inches diameter, and four feet in length, drawn by one horse, is now moved along the ridges. It covers two at a time, which are thereby reduced to this form :—



The tops *t*, *t*, *t*, are generally about ten or twelve inches broad, in the middle of which the turnip-seed is deposited, in a rut made by the coulter of the sowing machine, which is fastened to the hinder part of the above roller by a cord about nine feet long; the distance between *t*, *t*, *t*, or each row of turnip-seed, being twenty-six inches; and if the ploughing and spreading have been properly performed, the dung will be

nearly in the position, M, M, M. Thus the agriculturist is not subject to the waste of any part of his manure, and reaps the superior benefit of having the turnip-seed regularly sown, in a rut of a proper depth, penetrating nearly to the dung in the middle of the small ridges; —a method which seems better calculated to give to the cultivator of the field advantages similar to the rapid and vigorous vegetation promoted by the *hot-bed* of the garden, than perhaps any other mode of culture. The importance of having *all* the dung perfectly covered, is evinced by the result of the above experiment; for, with the exception of a small part of it, in a few drills on No. 2, not being perfectly covered with the soil, there was no difference *whatever* between the management of that ridge and the mode pursued on No. 3. In dry weather, the roller is moved twice along each ridge, first to compress the soil, and next to close

close the rut made by the coulter of the sowing machine, to secure the turnip-seed from depredation and drought: but if the soil be so moist as to stick to the roller, it is moved only once along each drill; and some able husbandmen are of opinion, that this is the most advantageous mode *in any state of the soil;* that without the second rolling, the turnip-seed will vegetate regularly; and that, while young and tender, the plants will be beneficially sheltered by the rut of the sowing-machine in adverse weather. Some cultivators form the drills, or small ridges, with a common single plough, and in many situations they are made more straight and neat than with the double plough. With the latter, however, they may, in most situations, be sufficiently well formed, at about half of the expense incurred by using the single plough, *which does not cover the dung better than the other.*— The skuffler, an implement with three

or five hoes, is sometimes used to clean the intervals. Some, however, prefer using two small ploughs of the common form, four or five inches broad at the bottom, and fastened together by screws, which increase or diminish their distance from each other, according to the breadth of the intervals. This implement is drawn by one horse, and, by being moved *once* along each interval, cuts a proper quantity of earth from each side of the row of plants; and by proceeding in this manner, a ridge of earth is laid up in the middle of each interval. This mode is the best in situations where the drills are not perfectly straight. Where they are *quite* straight, an implement is used, which, instead of moving the earth from each side of one drill, cuts it off the inner sides of two drills; and in either method the hoeing of the intervals may be performed with equal expedition. A few weeks after these small ridges are formed

in

in the middle of the intervals, they are generally split by a double plough drawn by one horse, the earth being laid close against the turnips on each side. These operations not only destroy the weeds in the intervals, but give to that part of the land the advantages of a bare fallowing, and, besides being *greatly* cheaper, are much more fertilizing than hand-hoeing. In this mode of cultivation the turnips attain a greater size than under the broad-cast method, or that with narrow intervals; and though the plants are generally left at about eleven inches apart in the rows, which reduces the number on an acre, when the crop is a full one, to about 21,900, the result of the above experiment will not be surprising, when it is considered, that from the properties of similar solids, the weights of well-formed (spherical) turnips are in the ratio of the cubes of their diameters, and consequently that one of eight inches and a half

half diameter will weigh nearly as much as three of six inches diameter each.—Nearly all the farmers in this district use their utmost endeavours to obtain turnips of a large size, which, together with the other important advantages derived from it, has long induced them to prefer drilling on small ridges, with broad intervals, to any other mode of culture; and within the last twenty years, it has become the almost universal practice in the counties of Northumberland, Roxburgh, Berwick, and East Lothian,—an extensive and extremely well managed district; in which, I believe, the rents of land are considerably higher than in any other in this kingdom. In several, the drills are not drawn at right angles to the ridges (I mean the common ridges of the field), but in a diagonal direction; it having been found, that the seed-furrow in the succeeding spring, together with the effects of common harrowing, not only reduces

reduces the land to an *even* surface, but that after such management, the crops of corn are *uniformly* luxuriant and productive, the manured parts being, in these operations, well mixed with the soil in the intervals. I am satisfied, from my own practice, and pretty accurate observation on that of others, that with *considerably less* manure, as weighty a crop of turnips may be obtained by this method of cultivation, as by that with narrow intervals, or in the broad-cast husbandry; and, as it is generally difficult to raise as much dung as will manure the whole of the fallow land, at the rate of fourteen to sixteen loads an acre, this, *in promoting the growth of more extensively luxuriant crops, and increasing the quantity of manure for those which succeed,* is an invaluable advantage. Besides, in unpropitious seasons, when, under the broad-cast and narrow drill system, a judicious agriculturist would not cultivate turnips on land

land he has not been enabled *thoroughly* to pulverize and clean, he would venture to raise them where the spaces between the rows are sufficiently broad for the admission of the horse and the plough, under an idea that before their tops covered the intervals, (which they generally do about the beginning of October) his ground could be brought into a proper state.—You will no doubt remark, that the crop I obtained even on No. 3, was but scanty; and conceive, however, notwithstanding that circumstance, that the experiment satisfactorily shows the superiority of the mode of management pursued on that ridge.—By the same mode, I obtained a crop on the land surrounding that on which the experiment was made, which, considering the extreme dryness of the summer, and that it was sown at the same late period of the season as that upon the experiment ground, may be reckoned a very productive one; and, as the

soil

soil was not superior in quality, it may be of some consequence to endeavour to account for this difference. The land marked out for the experiment, contained some couch and other weeds, which I wished to eradicate; it therefore received a common ploughing *only a few days previous to the seed being committed to the ground.* The surrounding land had lain for a much longer time between the last ploughing and the seed-furrow, and contained more moisture at the time of sowing them than the other; and though this, in a humid season, would not have caused a material difference in the crops; yet, in a summer so extremely dry as the last, it was attended with important advantages. To these I may add others; for dung having last year been unusually plentiful, it was manured with about *twenty* loads an acre, and with dung in a very *moist* state; whereas, that applied to the land on which the experiment

ment was made, lost a considerable portion of its moisture by evaporation, during the time of mixing *well*, for the purpose of rendering *all* parts of it equal in quality.—Perhaps it may not be deemed unimportant to state, that the prevailing opinion is, that *very dry seasons are more unfavourable to the turnips raised on the small ridges (drills) than to those produced on land with a flat surface.*

No. 4.

The same objections which have been urged against the manner of applying on No. 1. may be advanced against the mode of cultivation pursued on this ridge, under which the plants cannot be left with such precision and regularity as in the drill husbandry.

Expense

Expense of each mode of Culture.

The management pursued on Nos. 1 and 4, is less expensive *up to the time the plants become fit for hoeing*, than that pursued on Nos. 2 and 3. This saving of expense, however, is overbalanced by the cheapness of hoeing under the latter mode, and by the advantages derived from that operation being performed before the plants become too large. The general expense of hoeing broad-cast turnips, in this quarter, is about seven to ten shillings per acre, of 4840 square yards. Those in drills, with narrow intervals, will cost as much; and when it is considered, that an acre of these contains twice as many rows as the same quantity of ground under the broad intervals, and that these intervals are quickly and efficaciously hoed with the horse and plough, it will be readily conceived that the latter mode is the least expensive *upon the whole.*

whole. As the turnips under this experiment did not grow uniformly, some parts were much sooner fit for hoeing than others. The person that hoed them was sometimes not employed among them above an hour in the day; which prevents my furnishing an accurate account of the expense of hoeing each ridge.

So easy is the operation of hand-hoeing the small ridges or drills with broad intervals, that, in this quarter, it is nearly all performed by women, boys, and girls. If we depended on men, as the farmers do in some other districts, we could not *perfectly* hoe much more than one third of our turnip crops.

I am, Sir,

Your most obedient Servant,

W. Watson.

North Middleton, near Wooler,
by Belford, Northumberland,
Feb. 18th, 1804.

Chas. Taylor, Esq.

Certificates

Certificates from Mr. Adam Rutherford and Mr. J. Barbearn confirmed the above statement, and the accuracy of Mr. Watson's Experiments.

The GOLD MEDAL, or THIRTY GUINEAS, at the option of the Candidate, was this Session adjudged to Mr. JOHN SHIRREFF, of Captain Head, near Haddington, in North Britain, for preserving TURNIPS in winter.

The following ACCOUNTS and CERTIFICATES were received from him, and the pecuniary Reward paid to him, at his desire.

SIR,

OBSERVING that the Society for the Encouragement of Arts, &c. offer a reward for preserving turnips; and having been in the use of drawing and stacking the whole, or the greatest part of my turnip crop for several years past, in autumn, for consumption during the following winter and spring; and having found the practice attended with much convenience, economy,

nomy, and emolument, I have taken the liberty to submit my simple mode of executing this operation in husbandry, with requisite certificates, and an account of expenses, in competition for the Society's honorary reward.

I am, SIR,
Your most obedient Servant,
JOHN SHIRREFF.

Captain Head, near Haddington,
Oct. 27, 1803.

CHARLES TAYLOR, Esq.

Rapa solo molli et aere humidulo lætantur.

SATISFIED, from observation and experience, that turnips are the foundation of the best husbandry on almost all soils and situations in the arable districts of Great Britain; and

that this crop should always be drawn, except from blowing sands, or light moorish soil, on both of which it should always be in part consumed on the ground with sheep; convinced also, that turnips, if possible, should be off all soils, and the land ploughed up before the middle of December, at the latest, to secure the succeeding corn crop, and grasses, or clovers, with either of which every field that carried a turnip crop the preceding season, should, in almost every case, be sown down; and impressed with the many high advantages attending this practice, as soon as my pea and bean stubbles are ploughed up, and sown with wheat; my turnips are begun to be drawn, and stacked up for use during the following winter and spring. If the distance of the turnip field from the homestead does not exceed a quarter of a mile, two double-horse carts only are employed, and more in proportion

portion to the distance of the turnip field, or number of hands you may be able to command to carry on the work. One clever driver is sufficient for two carts, and two for three carts, &c. one cart being always in the field loading or loaded. On being brought home, the turnips are instantly tumbled out at the stack; which is done with great facility, from the construction of the carts in this district, which to convenience and strength likewise add lightness, to enable horses to move at a smart pace with them when empty. The turnips tumbled out of the cart, are trimmed of their leaves, and cleaned of any earth that may adhere to them, by women, &c. before being put into the stack. Old table-knives do very well for the purpose, and the leaves should be cut off close to the root; the back of the knife being used for removing any pieces of soil that may stick on the turnip.

Women, &c. trim the turnips, and put them into strong coarse wicker baskets, to be carried forward by a man, who hands them to another, who lays them into or on the stack. The ground on which the turnips are placed ought to be dry bottomed. If that is not the sort of soil where you find it most convenient to make your stack, a quantity of boulders may be put on, regularly spread over the space, to the thickness of at least eighteen inches. My corn-rick yard, being dry ground, has been used as the place for keeping my turnips in. The stacks have been made about ten feet wide, by driving a row of stakes into the ground parallel to the wall of the yard, which serves instead of another row. The wall is only about five feet and a half high, and the stakes are driven to the same height. The inside of the wall and stakes are lined with compact bunches, or sheaves of wheat-straw, about ten inches

inches in diameter, placed horizontally on the ground or boulders, and introduced, as wanted, during the operation of stacking. A tire of the largest turnips are placed one above another, on the inside of the bundles of straw, more particularly on the side guarded by the stakes, till the pile reaches the height of five feet from the ground, or from the boulders, if it has been found necessary to spread any over the ground. The inner part of the stack is at the same time gradually made up with turnips put in promiscuously; along which a plank is laid, and occasionally shifted as the pile rises, for the man who builds the stack to stand on without bruising the turnips with his shoes. When the pile of turnips is reared, in the manner described, to the height of above five feet, it is gradually contracted inwards, on both sides, at an angle of about forty-five degrees, like the roof of a barn; the largest turnips being still piled on

the outside, till the roof is so far completed. The stack is every day so far finished in height as it is extended in length, and is covered with wheat-straw thatch, roped down with twisted bands of oat-straw before evening, to secure the stacked turnips from rain that may fall during the night. The thatch is laid on a foot thick, and secured in the same simple, effectual manner, that corn-ricks are covered in Northumberland, Berwickshire, and the Lothians; with this difference only, that the straw is four times as thick laid on the turnip as on the corn, to exclude cold as well as wet; and that there is a rail of wood stretched, hanging horizontally at the tops of the wall and stakes, to fix the straw ropes to, which secure the thatch on the stack. The end of the stack is every night covered with bundles of wheat-straw, which are removed next day, or when building recommences.

Three

Three men are employed in the field to load and dispatch the carts, occasionally assisting four women who draw the turnips, striking off the top root with a strong heavy knife, leaving the turnips on the tops of the drills as drawn and chopped, with the leaves all in one direction, to be readily laid hold of by the men who lift them up to the cart. The horses pass along in the space between the two rows or drills of the turnips, which may be drawn: and, being at thirty inches apart, and the extremities of the wheels about five feet from each other, it is evident a wheel runs in the middle of each space between the contiguous drills, without injuring the turnip, whether drawn or not. When the cart is about to turn, after being loaded, the men move the turnips to make room for the horses, putting them into the cart as part of the load.

Expenses

Expenses of drawing, carting, trimming, stacking, covering, &c. a statute acre of good turnip,—at the distance of not more than a quarter of a mile from the stack.

	£.	s.	d.
Two double-horse carts, and one man -	0	16	0
Two men loading, drawing, building, &c. -	0	8	4
Seven women drawing and trimming - -	0	4	1
Two girls trimming - - - -	0	1	0
Four ditto and boys ditto - - -	0	1	8
Twisting ropes, drawing thatch, thatching, waste of thatch, stakes, &c. say, - - -	0	3	6
	£1	14	7

The above is a fair average of the expense of securing somewhat more than twelve and a quarter statute acres last season, which was all I drew; and one field of two acres, one rood, thirty-three perches, was so far distant as to require three carts, and two drivers. That field, however, was first drawn, and the weather being fine and moderate, more work was done in proportion

tion to the length of the day, which was also longer. Women and children cannot, indeed, exert themselves with spirit, in raw cold weather. October is perhaps the best month to draw in. It is a question with me, whether the average of the acres that are under turnip in the island, if the weight exceeds twenty-four tons, does not cost more, merely for drawing and carting only. When it is considered that this operation is performed often in cold, frosty, and stormy weather, and that frequently much snow may be to be removed before the turnip can be seen. If no snow has fallen before the frost sets in, the turnips must be hoed up with instruments for the purpose. Many are cut, and much left in the ground of the lower part of the root. After all this labour, what is obtained is frequently no better than a lump of ice, environed with earth, frozen so firmly to its surface, that nothing but thawing

in

in cold water can ever render it fit to be touched by the mouth of any animal whatever.

Admitting, however, the expense of drawing and carting to be the same, all that can be stated as extraordinary expense is the cost of trimming and sacking, which amounts to 11s. 3d. an acre. On the other hand, we have the advantage of having fine fresh clean turnips, always secure and at command, to carry on feeding and breeding stock; at the same time that all loss by rotting in the spring months is prevented, which is frequently thirty and even fifty per cent. on all the crop that remains in the field, after the first of February. Above all, the practice of drawing and stacking before winter, by admitting of early ploughing to mellow the soil, secures a valuable corn, and succeeding clover crops. When all these circumstances are maturely weighed, the expense of eleven shillings and three-

pence

pence will, to every enlightened agriculturist, appear but trifling to obtain such very valuable advantages. The writer of this little essay has had the satisfaction of having excellent crops after his turnips, this season; while almost every other crop in the neighbourhood was indifferent; and some on rich dry loams, high rented, by being sown in the months of April and May, on the Spring ploughing, after turnips eaten off with sheep, were so miserable, as evidently to pay *nothing* after expenses of labour, seed, and reaping. The young clovers too, sown with these crops, have almost entirely perished from want of moisture. The loss of the crop and clover seed is not all: the system suffers a derangement, the consequences of which none but practical men can calculate.

One thing remains to be noticed, which is, that twenty-six young cattle, cows, and yearling calves, were kept nearly

nearly three weeks on the turnip trimmings, with oat-straw along with them, to their improvement; and that many more might have been kept, had they been provided in time. A quantity of good manure was made; and, estimating all advantages arising from the consumption of the leaves in this way, at no more than 3d. a head per night, for the keep of each beast, the amount will exceed the expense of trimming and stacking the whole crop of turnips on twelve acres and a quarter. The leaves that remain on turnips after Christmas, are either unfit to be eaten, or wasted by the frosts.

T. Shirreff.

Certificates of the truth of the above particulars were received from John Hepburn, of Bearford; David Shirving, of Garleton; and John Donaldson, of Haddington; stating, that the quantity

tity of land in common turnips was nearly ten acres, and the average weight on sixteen perches was two tons eight hundred and thirty-six pounds avoirdupoise; that on another field of two acres, one rood, and thirty-three perches,—Mr. Shirreff had an excellent crop of Roota Baga, or Swedish Turnip, superior to the average of the field above mentioned. That the whole of Mr. Shirreff's turnips were drawn and stored before the 26th of November, and the land on which they grew ploughed before the 1st of December;—that the turnips were consumed during the months of December, January, February, March, April, and May last, by cattle and sheep, and the Roota Baga, by horses, milch cows, and pigs;—that what remained of the turnips in the first and second week of May were in excellent condition.—That the field on which the turnips grew, was sown with wheat about the 8th of March last, and that on which the Bagas

grew,

grew, about the 10th of the same month with barley;—that both the crops were good, and superior to any they had seen after turnips the last crop. That they consider the wheat crop equal to thirty-two, and the barley crop equal to fifty-two, Winchester bushels on the English statute acre. That both fields are sown down with clovers, which have succeeded well also;—and that they attribute the success of the clovers, as well as corn crops, to the early removal of the turnip, and the land being ploughed up, to be mellowed by the winter's frost, which made the soil retain the proper moisture.

By a second letter from Mr. Shirreff to the Secretary, dated May 17, 1804, he states—That he has the satisfaction to say, that to ascertain the real value of the clover grasses, he let them at public vendue for pasture this season, from the 1st of March last to Christmas next, for six pounds sixteen shillings sterling

the

the Scotch, or five pounds eighteen shillings and ninepence the English statute acre.

Mr. Shirreff further adds,—that the plantation of osiers and willows for establishing which he received the Society's Gold Medal in 1803, as noticed at length in the 21st Volume, has afforded a very abundant crop this season; the peeling, drying, storing, &c. of which has afforded advantageous employment to upwards of fifty women, girls, and boys, for the last three weeks, besides to several men in cutting the rods in March last;—that he had got a quantity bolted, and sold to the Manager of the Asylum for the Blind, in Edinburgh, which had given much satisfaction.

The THANKS of the Society were this Session voted to J. DE LANCEY, Esq. of the Island of Guernsey, for the following Communications relative to the PRESERVATION of POTATOES.

SIR,

I BEG you will do me the favour to submit the annexed observations to the consideration of the Society, assuring them, I have no other object in offering them to their notice, than the public advantage; convinced that, under their patronage, the idea of burying potatoes, carrots, parsnips, &c. below the point of vegetation, may be materially extended and improved upon. I have not, from my insular situation, had an opportunity of knowing what is going on in the experimental world; it would, therefore, be a satisfaction to hear whether the idea submitted to the Society

may

may, in any shape, be productive of farther improvement, as I may be tempted to carry it on.

I have the honour to be, Sir,
Your obedient Servant,
J. De Lancey.

Guernsey, Jan. 24, 1804.

Charles Taylor, Esq.

Experiments on preserving Potatoes.

Early in March, 1803, I observed my winter's stock of potatoes, which I had dug in October, 1802, sprouted from the mildness of the weather in this Island: it occurred to me, that, by putting them under ground, vegetation might be retarded. I accordingly took indiscriminately from my pile about three dozen, and in my court-yard dug a hole two feet and a half deep, under the protection of a South-West wall, where the rays of the sun prevail for a

few minutes only during the day at any season of the year; then, with three pan-tiles, one at bottom, I laid most of the potatoes in the hole, and placed the other two tiles over them, in form of the roof of a house: they not containing all, I threw the remainder carelessly into the hole (having no great confidence in my experiment), covering the place over to its usual level. Business calling me from home during part of the summer, I neglected looking after my small deposit; but, on the 21st of January, 1804, nearly eleven months after covering them, I had the curiosity to examine them; when, to my astonishment, I found them (two or three excepted, which were perforated by the ground-worm, though firm) all perfectly sound, without having in the least vegetated, and in every respect fit for the purpose of sets and the use of the table, as I have boiled a few, and found them similar in taste and flavour to new potatoes.

tatoes. I further pledge myself that they were perfectly firm. I have still some of them by me, for the inspection of my friends, who all agree with me that they are so.

J. De Lancey.

Guernsey, Jan. 24, 1804.

SIR,

I HAVE received the favour of your letter of the 7th inst. conveying the Thanks of the Society, for my experiments in the Preservation of Potatoes, which is highly gratifying to my feelings. I avail myself of the opportunity of a friend going to London, to send three of the potatoes as a confirmation of their being fit for sets, as they are actually sprouting. I have still a few left, which I shall plant.

The potatoes I send, I pledge myself to you, are of the growth of 1802, when I first dug them out of the ground: neither have they been under the ground

since January 21, 1804, but lain in a closet. I have buried some others of the last year's growth, with a few carrots and parsnips, in a similar manner to my former experiments, the result of which I shall make known to the Society.

I remain, Sir,
Your obedient Servant,
J. De Lancey.

Guernsey, May 17, 1804.

Charles Taylor, Esq.

The above Potatoes were examined before a Committee of the Society, on the 30th of July, 1804, and found to be in a state fit for vegetation.

Charles Taylor, Secretary.

PAPERS

IN

CHEMISTRY.

CHEMISTRY.

The GOLD MEDAL of the Society was this Session voted to Sir H. C. ENGLEFIELD, Bart. of Tilney-street, for his Discovery of a LAKE from MADDER; from whom the following COMMUNICATION was received.

SIR,

AFTER many experiments on the red pigment to be prepared from madder, I have obtained from it a colour far superior to any which I have ever seen produced from it. I have received from many of our most distinguished artists very satisfactory reports of its excellence. I mean to make my process public; and if it should be consistent with the views of the Society of Arts, &c. to publish it, and they should think the improvement I have made

made worthy of a Premium, I shall be much flattered by their approbation.

I shall be much obliged to you by a line in answer; and am, Sir,

Your obedient Servant,

H. C. Englefield.

Tilney-street, May-Fair, Dec. 15, 1803.

Chas. Taylor, Esq.

THE want of a durable red colour, which should possess something of the depth and transparency of the Lakes made from cochineal, first induced me to try whether the Madder root, which is well known to furnish a dye less subject to change by exposure to air, than any other vegetable colour, except indigo, might not produce something of the colour I wanted.

Several of the most eminent painters of this country have, for some time, been in the habit of using madder lakes in oil pictures: but the colours they possessed under this name were either a

yellowish

yellowish red, nearly of the hue of brick-dust, or a pale pink opake, and without clearness or depth of tint, and quite unfit to be used in water-coloured drawing, which was the principal object of my search.

My first attempts were to repeat the process given by Margraf, in the Memoirs of the Academy of Berlin: but the colour produced by this mode was of a pale red, and very opake, although the eminent author of the process states the colour he produced to be that of "*le sang enflammé*," which probably means a deep blood colour. It may, however, be observed, that colours prepared with a basis of alumine will appear much deeper when ground in oil than they do in the lump, the oil rendering the alumine nearly transparent. This advantage is, however, lost in water-colours. On examining the residuum of the Madder root, after it had been treated in Margraf's method, it appeared tinged with

with so rich a red, that it was obvious, that by far the greater part of the colour still remained in it, and that the most powerful and beautiful part. To extract this, several ineffectual trials were made, which it would be useless to enter into; but, on attentively examining the appearances which took place on infusing the Madder in water, I began to suspect that the red colouring matter was very little, if at all, soluble in water, and that it was only mechanically mixed with the water when poured on the root, and suspended in it by the mucilage, with which the root abounds.

A very small quantity, therefore, can be obtained by any infusion or decoction, as the greater part sinks down on the root, or remains with it on the sieve, or in the bag, through which the infusion or decoction is passed to render it clear. I therefore was induced to try whether, by some merely mechanical means,

means, I could not separate the colouring matter from the fibrous part of the root. In this attempt my success was fully equal to my hopes; and, after several trials, I consider the process I am now about to describe, as the most perfect I have been able to discover.

Process 1.

Enclose two ounces, troy weight, of the finest Dutch madder, known in commerce by the name of crop madder, in a bag, capable of containing three or four times that quantity, and made of strong and fine calico. Put it into a large marble, or porcelain mortar, and pour on it about a pint of cold soft water. The Thames water, when filtered, is as good as can be used; it being very nearly as pure as distilled water, at least when taken up a very little way above London. With a marble or porcelain pestle, press the bag strongly in every

every direction, and, as it were, rub and pound it as much as can be done without endangering the bag. The water will very soon be loaded with the colouring matter, so as to be quite opake and muddy. Pour off the water, and add another pint of fresh water to the root, agitating and triturating it in the manner before described; and repeat the operation till the water comes off the root very slightly tinged. About five pints of water, if well agitated and rubbed, will extract from the root nearly the whole of its colour; and if the residual root be taken out of the bag and dried, it will be found to weigh not more than five drachms, apothecaries weight; its colour will be a kind of light nankeen, or cinnamon, and it will have entirely lost the peculiar odour of the root, and only retain a faint woody smell.

The water loaded with the colouring matter, must be put into an earthen or well-

well-tinned copper, or, what is still better, a silver vessel, (for the use of iron must be carefully avoided through the whole), and heated till it just boils. It must then be poured into a large earthen or porcelain bason, and an ounce troy weight of alum dissolved in about a pint of boiling soft water, must be poured into it, and stirred until it is thoroughly mixed. About an ounce and a half of a saturated solution of mild vegetable alkali should be gently poured in, stirring the whole well all the time. A considerable effervescence will take place, and an immediate precipitation of the colour. The whole should be suffered to stand till cold; and the clear yellow liquor may then be poured off from the red precipitate. A quart of boiling soft water should again be poured on it, and well stirred. When cool, the colour may be separated from the liquor by filtration through paper in the usual way; and boiling water should be

be poured on it in the filter, till it passes through of a light straw colour, and quite free from any alkaline taste. The colour may now be gently dried; and when quite dry, it will be found to weigh half an ounce; just a fourth part of the weight of the madder employed.

By analysis, this colour possesses rather more than 40 per cent. of alumine. If less than an ounce of alum be employed with two ounces of madder, the colour will be rather deeper; but if less than three quarters of an ounce be used, the whole of the colouring matter will not be combined with alumine. On the whole, I consider the proportion of an ounce of alum to two ounces of madder, as the best.

Process 2.

If, when the solution of alum is added to the water loaded with the colouring matter of the root, the whole be

be suffered to stand, without the addition of the alkali, a considerable precipitation will take place, which will be of a dark dull red. The remaining liquor, if again heated, will, by the addition of the alkali, produce a rose-coloured precipitate of a beautiful tint, but wanting in force and depth of tone.

This is the process recommended by Mr. Watt, in his Essay on Madder, in the *Annales de Chymie*, *Tome* 7; and this latter colour is what may perhaps, with propriety, be called Madder Lake. But, although the lighter red may be excellent for many purposes, yet I consider the colour produced by the union of the two colouring matters, as given in the first process, as far preferable for general use, being of a very beautiful hue when used thin, and possessing unrivalled depth and richness either in oil or water, when laid on in greater body.

If but half an ounce of alum be added to the two ounces of the root, the first precipitate will be nearly similar

to that when an ounce is employed; but the second, or lake precipitate, will be less in quantity, and of a deeper and richer tint. In this case the whole of the colouring matter, as before observed, is certainly not combined with the alumine; for, on adding more alum to the remaining liquor, a precipitate is obtained of a light purplish red. In this process, when two ounces of madder and an ounce of alum are used, the first precipitate has about 20 per cent. of alumine, and the second, or lake precipitate, about 53 per cent.; but these proportions will vary a little in repetitions of the process.

Process 3.

If the madder, instead of being washed and triturated with cold water, as directed in the foregoing process, be treated in exactly the same manner with boiling water; the colour obtained will be rather darker, but scarcely of so good

good a tint; and the residuum of the root, however carefully pressed and washed, will retain a strong purplish hue; a full proof that some valuable colour is retained in it, probably fixed in the woody fibre by the action of heat. Mr. Watt, in his excellent Treatise on Madder above mentioned, observes, that cold water extracts the colour better than hot water; and I have reason to suspect, that a portion of that colouring matter, which produces the bright red pigment, distinguished before by the name of Madder Lake, remains attached to the root, when acted on by boiling water.

Process 4.

If to two ounces of madder, a pint of cold water be added, and the whole be suffered to stand for a few days (three or four days) in a wide-mouthed bottle, lightly corked, in a temperature of between 50° and 60°, and often shaken; a slight fermentation will take place,

the infusion will acquire a vinous smell, and the mucilaginous part of the root will be in a great degree destroyed, and its yellow colour much lessened. If the whole be then poured into a calico bag, and the liquor be suffered to drain away without pressure, and then the root remaining in the bag be heated with cold water, &c. exactly as directed in the first process, the red colouring matter will quit the root with much greater ease than before fermentation. It will also be equal in quantity to that afforded by the first process, but of a much lighter red. This difference of tint appears to be owing to a destruction of a part of the lake by the fermentation of the root; for if the colours from the fermented root be obtained separate, as in Process 2, the first precipitate will not sensibly differ from that obtained from the unfermented madder, but the second, or lake, will be of a very light pink. This process, then, is not to be recommended.

Spanish

Spanish and Smyrna Madders.

Spanish Madder affords a colour of rather a deeper tone than the Dutch Madder, but it does not appear to be of so pure a red as the Zealand Crop Madder.

The Smyrna Madder is a very valuable root. The colour produced from it by Process 1, is of a deeper and richer tint than any I have obtained from the Dutch Madder. The quantity produced from two ounces, is only three drachms, twenty-four grains: but this is not to be wondered at; for as this madder is imported in the entire root in a dry state, and the Crop Madder of Zealand consists principally of the bark, in which probably the greatest part of the colouring substance resides, there is every reason to think that the Smyrna Madder really contains a greater proportion of colour than the Zealand, in equal weights of the entire root.

The products of Process 2 prove, that the *lake* of the Smyrna Madder is more abundant in quantity, and of a richer tone than that of the Dutch root; for, from two ounces of Dutch Madder the first precipitate was two drachms, and the lake was two drachms and forty-eight grains; whereas, from two ounces of the Smyrna root the first precipitate was one drachm and twenty-four grains, and the lake was two drachms and twenty-four grains. The proportion of the lake to the other colour is, therefore, much higher in the Smyrna, than in the Dutch root.

Fresh Madder.

The colour may be prepared from the recent root; and it will be of a quality equal, if not superior, to any other. The difficulty of procuring the fresh root has prevented me from making as many experiments on it as I could have wished. I procured, however, a small quantity of the best roots packed in moss from Holland,

Holland, and the following process answered perfectly well.

Eight ounces of the root having been first well washed and cleaned from dirt of all kinds, were broken into small pieces, and pounded in a bell-metal mortar, with a wooden pestle, till reduced into an uniform paste. This paste being enclosed in a calico bag, was washed and triturated, as described in the first process, with cold water. About five pints seemed to have extracted nearly the whole of the colour. To the water thus loaded with colour, and boiled as before, one ounce of alum, dissolved in a pint of boiling water, was added, and the alkali poured on the whole, till the taste of the mixture was just perceptibly alkaline. The colour thus obtained, when dry, was of a very beautiful quality.

The success of this experiment, which was twice repeated with the same result, has led me to hope, that it is not

impossible that the mode of obtaining the colour from the fresh root here described, may be productive of advantages for more extensive use than I had in view when first I attempted to obtain a pigment from madder. Many tracts of land in this country are as well adapted to the growth of this valuable article, as the soil of Holland can be; and the cultivation of it, which has more than once been attempted to a considerable extent, has been laid aside, principally from the expense attendant on the erection of drying-houses and mills, and the great expense and nicety requisite for conducting the process of drying. But should the colour prepared in the mode just described, be found to answer the purposes of the dyers and calico-printers, the process is so easy, and the apparatus required for it so little expensive, that it might be in the power of any grower of the root to extract the colour: besides which,

which, another great advantage would be obtained; the colour thus separated from the root, may be kept any length of time, without danger of spoiling, and its carriage would be only one fourth of that of the root. I am, moreover, thoroughly inclined to believe, that in the present mode of using the root, a very considerable part of the colour is left in it by the dyers; and, should this prove to be the case, an advantage much greater than any hitherto adverted to, may arise from the process here recommended.

Should it be attempted to obtain the colour from the fresh root, on an extensive scale, I should recommend, that the root be first reduced to as uniform a pulp as possible, by grinding or pounding. To this purpose, it is probable that the cyder-mill would answer perfectly well; and its extreme simplicity is a great recommendation. For the purpose of trituration, bags of woollen,

len, such as are used in the oil-mills, would probably answer as well as calico, and they would be much cheaper and more durable. A large vat, with stampers, would be easily constructed, by those who are conversant in mechanicks, for the holding them and pressing them in water; and when the colour was boiled and precipitated, the flues of the boilers might easily be formed into convenient drying tables, without any additional expense of fuel. The part of the process, which I consider as of the greatest importance, and as being the essential advantage of my methods over all those which have come to my knowledge, is the trituration or pressing of the root in water; and I believe that the colouring matter of the root has not been hitherto considered as so nearly insoluble in water, as I have reason to think it is.

It were much to be wished, that in the present advanced state of Chemistry, some

some skilful analyser would investigate the properties of this very useful root; in which perhaps it will be found, that there are three, if not four, different colouring substances. Such are the processes and views, which I have thought it not improper to submit to the consideration of the Society of Arts, &c.

I have only now to describe the specimens which accompany this Paper; assuring the Society, that they have been all prepared by my own hands entirely, and that I am therefore responsible for their having been produced by the processes stated, without the addition of any foreign matter whatever, excepting the cake ground up with gum, and the bladder of oil-colour, which were prepared from the colour which I gave him, by Mr. Newman, of Soho-square, whose skill and fidelity are too well known to need any testimony in their favour.

It

It may be proper to add, that all the colours produced from the Dutch Madder were prepared from the same parcel of Crop Madder, in order that the differences in them might proceed from the processes, and not from a variation in the qualities of the root, which, in different specimens, will produce different shades of colour under the same mode of treatment.

1. Dutch Madder, treated by Process 1st.
2. Ditto ..... Process 2d.
3. Ditto ..... Process 3d.
4. Ditto ..... Process 4th.
5. Dutch Madder, two ounces; alum, half an ounce; treated by Process 2.
6. Dutch Madder, two ounces; alum, one ounce; fermented two days, and then treated by Process 2.
7. Produce of Process 1, ground in gum by Mr. Newman.
8. Produce of Process 1, ground in oil by Mr. Newman.

S—1. Smyrna Madder, by Process 1.
S—2. Ditto ..... Process 2.
S—3. Ditto ..... Process 3.
S—4. Ditto ..... Process 4.

CERTIFICATES

CERTIFICATES accompanied the foregoing description, from Mr. Cotman and Mr. Munn, testifying the merits of Sir H. Englefield's Madder Lakes, as water-colours; and also from Messrs. West, Trumbull, Opie, Turner, Daniel, and Hoppner, speaking greatly in its favour, where it has been tried in oil-colours.

The

The GOLD MEDAL of the Society was this Session voted to Dr. WILLIAM DYCE, of Aberdeen, for his Discovery of a MINE of MANGANESE; from whom the following COMMUNICATION was received.

SIR,

AS it seems to be the professed purpose of the institution of the Society of Arts, &c. to encourage any discovery, that may either directly or indirectly facilitate the progress of the useful arts; I beg leave to intimate to them a discovery which I have made, of no small importance to the extensive cotton, linen, and thread manufactures in this country:—it is a very fine vein of Manganese, of immense extent, which I have opened in the neighbourhood of this

this town, and have been now working it for these six weeks past. It yields about twenty tons per week, which gives employment to twelve men. I need hardly mention to the Society, that the oxygenated muriatic acid, either singly or combined in the process of bleaching, is of very extended, and almost universal use; nor shall I urge the advantages resulting to the manufacturer by adopting this method; but I must beg leave to mention, that this acid cannot be prepared at so cheap a rate from any other substance hitherto known, as from the black oxyd of Manganese. The immense demand of late, however, for this article, has, somehow or other, considerably enhanced its price, perhaps in consequence of the general use of the new method of bleaching: but I am told that the chief cause is owing to the veins in England being nearly exhausted, or that the mineral is more difficult to be procured from the hills than

formerly. In either case, however, it is an object of some consequence to the manufacturer to be able to be regularly supplied with the pure oxyd, and at a reasonable rate. Should the Society think the above information worthy of their notice, I shall be happy to have it in my power to give them whatever further information they may require, and at the same time, if agreeable, I shall forward a small cask, containing what quantity they may please to mention as a specimen.

I have the honour to be,

SIR,

Your most obedient Servant,

WM. DYCE, M.D.

Aberdeen, July 13, 1802.

CHAS. TAYLOR, Esq.

SIR,

SIR,

THE favour of yours of the 14th of February, in answer to mine of the 13th of July last, I received; and should have given an earlier acknowledgment to the favourable reception which the Committee of Chemistry were pleased to bestow on my communication respecting the Manganese, had not my other avocations, combined with a strong desire to afford all the information I could collect, prevented me.

With this, therefore, you will please to present to the Society the small cask of Manganese formerly mentioned. The quality of it is such as I should call fine, that is, if a certain quantity of the mineral be taken as it comes from the mine; various matters, as clay, granite, calcarious spar, barytes, &c. are mixed and strongly adhere to it, which lessens the quantity of oxygen to be derived

from a given quantity of the ore, and of course makes it less valuable. These foreign matters, therefore, must be separated, first by washing off the loose particles; and then by a hammer, which in general detaches a considerable portion of Manganese along with them. These, however, are not lost; for, by a little further trouble in separating as much as may be of the stony or foreign particles, another quality of Manganese is constituted, which is sold generally at half the price of the former. Of this kind, therefore, I have not judged it necessary to send any,—the loose pieces in the cask being all of the first quality; and as I thought it might be agreeable to the Committee to have some specimens of chrystallisations of this mineral, you will find various sorts enclosed in paper in the upper part of the cask, some of which are very beautiful and rare.

With regard to the situation of the Manganese mine, I have little to say that

that would afford either instruction or amusement; only I would observe, that the *bed* of veins seems to run through a large tract of country, but discoverable only by their proximity to the surface; and this bed, extending seven or eight miles in the direction from South to North, commences at the banks of the Don, and proceeds in that line to the sea, where it is found in the form of black sand, and sometimes in pretty solid masses. In this state, however, it would be very unfit for the bleaching process, as I apprehend more than double the bulk would be required to produce the necessary oxygenation of the acid, and of course a certain loss must be brought on by filling the still with heterogeneous matter—not to mention the waste of fuel required to heat such matter, and above all the difficulty of stirring so much solid matter in the still, by which the agitator is very soon broken, and the process rendered un-

productive, or the still destroyed. But although this sand-like Manganese may not be useful in this particular process, yet I have reason to think, that at no very distant period it may be found so in several arts of no less importance; and I hope to be excused from hazarding my opinion on two of these, wherein it might be used to considerable advantage. The first is, in the manufacture of earthen-ware; and next, in that of glass: the former of which requires more of this semi-metallic oxyd than all the other applications of it put together, although of less purity, and then chiefly as a colouring matter. But in regard to the latter, the chief purposes for which it is required are of a very different nature, and more nearly resemble the bleaching process; at least its effects upon that beautiful compound warrant my saying so; and accordingly we find that only the finest quality of Manganese will answer for the purposes of the glass-maker,

or

or such as contains the greatest quantity of oxygen, and at the same time the oxyd of no other metal; for it is well known that most of these afford all the beautiful variety of colour to be perceived on enamelled articles, as well as the different tinges of glass manufactured at different places, such tinges being acquired by some metallic particle, that might be, and is always contained or mixed in the sand of which the glass is composed; and by the addition of a small quantity of pure oxyd of Manganese to the glass infusion, it very soon becomes colourless; a little more gives it a violet or purple colour, and a little more renders it quite black. Now, I conceive, that if a due proportion of this black sand, with that of the other two articles, were melted together, a very fine and cheap glass might be made, and even with less trouble than the method now practised, but not having had any experience in the mi-

nutiæ of this manufacture, so as to enable me to speak decisively on the subject, I hope the Committee will pardon what I have advanced, should it be found inaccurate, or not strictly conformable to the ideas of the operator; or at any rate impute it to my zeal for the promotion of every branch of manufacture, which I consider so immediately connected with the views of the Society for the Encouragement of Arts, &c. &c.

Having taken a cursory view of the progress of the Manganese through the grounds in the vicinity of Aberdeen, that have fallen under my inspection, it is now proper that I should say a few words in regard to other parts a little more distant, confining myself entirely to the county of Aberdeen; but from what was said before, little is to be expected. However, in the course of my peregrinations, I have now and then picked up some specimens of this mineral,

neral, and having always considered it as the most extraordinary substance in nature, merely from its usefulness to me in the prosecution of my chemical studies (or rather I should say amusements), I have been led to search after it more minutely than perhaps I otherwise should have done, and yet, after all, nothing very remarkable has appeared to indicate its presence in any particular spot; for the whole of the ground where this mineral is to be got, abounds with granite, and, what is very remarkable, in one part of this chain or bed of veins, an immense rock of granite of the reddish kind, has its interstices filled with very pure manganese oxyd, in the chrystallised state, specimens of which you will find in the cask; but the quantity to be procured is so small, as to render it unprofitable in working. I mention these circumstances merely to confute a commonly received opinion, "that where granite abounds, metals

are not to be found," and also that I am right as to the direction of the veins of it; for among several rocks, exactly in the same line before stated, and not less than five miles South from the banks of the Don, the crevices of the stones are filled up with, or rather they would seem to be cemented and joined together by, a very thin stratum of Manganese.

Having said thus much in regard to the situation of the Manganese as it occurs in this part of the island, it is necessary that I now say something in respect to its quality; but as my opinion might not be satisfactory, I shall, in the first place, copy a part of a letter from Messrs. Tennant, Knox, and Co. of Glasgow, who are manufacturers of the bleaching liquor and bleaching salt, and supply a great part of the bleachers in England and Scotland with those articles. Their opinion, therefore, cannot fail of being satisfactory, and the more

so

so as it was given unsolicited: it is as follows:

"It gives us pleasure to be able to observe to you, that after a full trial, we found your Manganese equal to that either from Devonshire or America; and had we not had a very large stock on hand at the time, we should have gladly treated with you for a quantity."

And next I enclose a Certificate from Mr. James Ferguson, manufacturer and bleacher in this place. It is, therefore, unnecessary for me to say more on the subject, as I conceive its oxygenating power quite equal to any other that has hitherto been procured elsewhere.

As you say that the Committee would be glad to hear every particular respecting this very singular substance, I have taken the liberty of putting among the rest of the parcels, one marked "*Iron.*" On opening the same you will find two pieces of native iron. No. 1 was found in the centre of a lump

of

of Manganese, and is pure malleable metal; a circumstance of no small curiosity; and as such I have taken the liberty of presenting it to the Society. No. 2. is a piece of highly magnetic iron, found in considerable quantity in the vicinity of this place. It seems to be in the state of cast-iron, but has nothing else remarkable about it, than that it was found on the same estate where the manganese is procured, and very near the surface of the earth.

The other substance in the same parcel, (which I have not examined), appears to be chrystallised hæmatite, and is found in considerably large masses above the manganese, not less than four feet; the intermediate space being generally filled up with a kind of earth or clay of a reddish colour, in which is found many detached pieces of good manganese, that is, before coming to the first vein, and on passing through it, a stratum of decomposed granite of different

different degrees of thickness, or a kind of schistus, is to be met with, before coming to the next vein. In this manner it proceeds; but how far, I have never been able to ascertain, on account of the quantity of water that rises when at a certain depth. Upon finding the water rise, the workmen proceed horizontally, without being at the trouble to pump out the water; finding it easier to work in this way than otherwise.

Having taken the liberty of stating all that I at present recollect respecting this singular substance, I would yet trespass a little on the time of the Committee, by stating a process not hitherto known, but which may be of considerable importance to the public, namely,

A Method of separating the pure from the base Metals.

Hitherto this process has always been, as far as I have understood it, attended with

with considerable difficulty in the execution; but, by that which I am about to describe, is done with exact certainty. It was discovered and communicated to me by a gentleman in this neighbourhood. The process consists in mixing, not less than two parts of powdered Manganese with the impure or compound metal, which should be previously flattened or spread out, so as to expose as large a surface as possible, and broken or cut into small pieces, for the convenience of putting the whole into a crucible, which then is to be kept in a sufficient heat for a short time. On removing the whole from the fire, and allowing it to cool, the mixture is found to be converted into a brownish powder, which powder or oxyd is then to be mixed with an equal proportion of powdered glass, and then submitted in a crucible to a sufficient heat, so as to fuse the whole, when the perfect metals are found at the bottom in a state of extreme

extreme purity; a circumstance of no small importance to the artist and the chemist; the latter of whom will find no difficulty in separating the one from the other, with so little trouble compared with the former process, that I have no doubt it will always be practised in preference to the cupel.

Description of a Machine for cleansing Manganese.

I shall now conclude these observations, with the description of a very simple machine, invented by me, for washing and cleansing Manganese; by which means two men more effectually pick and clean a greater quantity than ten men could have done without it. But previous to my so doing, it may not be improper to state the method which is at present practised in Devonshire; from thence a more accurate idea will be formed of its utility. It consists in throwing

throwing a quantity of the mineral, coated as it were with clay and other matter, into a wooden trough or box (from six to eight feet long, two feet broad at bottom, but a little wider at top, which is open, and about a foot and a half deep), which is filled with water; the workmen then, by means of shovels, work the whole together, so as to dissolve or suspend in the water the lighter or adhering particles, which, by means of a hole and a plug adapted at the bottom of the trough, are allowed to run off at pleasure. After this, fresh water is added, and the same process repeated again and again, until the Manganese appears perfectly clean.—By this process, therefore, it will appear that much time must be consumed in these different ablutions; and that the working or turning over of such a heavy article by a spade or shovel, must constitute a very important charge in the preparation of the material. As it must likewise

likewise be the desire of every individual, as well as the professed design of the Society of Arts, &c. to lessen the expense of manual labour, in every instance where it can with propriety be followed, I am emboldened to lay the following sketch of the Machine before the Committee, and which I have no doubt may be applied to a variety of other purposes in the *washing* or *cleaning way*.

[The author here describes a machine exactly similar in structure to Mr. Curwen's Machine for washing Potatoes, described in Vol. xxi. p. 203, of Transactions of the Society of Arts, &c. in which two Engravings of it are given, excepting only that the author, where Mr. Curwen employs a perforated barrel, makes use of a cylinder composed of iron bars almost touching each other.]

When this instrument is to be used, the box or trough should be filled with water, and the door, which forms a portion

tion of the circumference of the cylinder, is to be laid open. A quantity of the material is then to be thrown into it; after which, the door or opening is to be shut and secured by means of an iron rod passing through two eyes in the ends of it. When so prepared, all that is necessary to be done, is to turn the machine for a few minutes, which completely separates, and washes off all the foreign particles. Now as the material to be washed is by no means light in comparison of its bulk, and as the cylinder itself is of considerable weight, it is needful to employ two men, that is, one at each handle, not because the strength of one man is insufficient to turn the instrument, but that it is necessary to remove the cylinder with its contents from the trough to a wheelbarrow, or otherwise, in order to empty the Manganese so prepared or washed; after which the cylinder is again placed on the bushes in the trough, and the same

same process repeated with a fresh quantity, as just now described.

It will no doubt occur to you, or any one who considers this instrument for a moment, that I am very deficient in many little contrivances that might be added to it; for instance, I have mentioned the weight of the cylinder and its contents as quite sufficient for the strength of two men: but it was my original idea to have placed a crane, or rather a lever placed on the top of a moveable perpendicular shaft, attached to one side of the box or trough, and by means of a chain connected with each extremity of the cylinder, to have lifted it out of the trough, and emptied its contents with the assistance of only one man.* As I, however, found on trial, that it answered so far beyond my expectations, I have never thought on

* Mr. Curwen's Machine already referred to, answers the object here alluded to by the author.

any further improvements than merely placing two upright pieces of wood, at a little distance from the trough, with a notch in each, for the purpose of receiving the extremities of the axis of the cylinder, and thereby admitting of its being more easily emptied on the ground, or otherwise.

From the hasty sketch now given, I hope the Committee will be able to form a just idea of this simple apparatus; and I cannot help again repeating the probability of its being of great use in many cases in life; one in particular just now occurs to me, and that is, the cleaning of feathers for bedding, where I conceive it might be used with the greatest advantage, instead of the method at present practised of beating them. In this case, however, the instrument might be altogether made of wood, the interstices considerably narrower, and the cylinder larger in diameter. But as I have deviated so widely

widely from my original intention, when I began this letter, by mentioning things somewhat unconnected with the purpose of this communication, I have only now to crave the indulgence of the Committee for so doing, and hope that if any thing be contained in this too long letter worthy of their attention, they will have the goodness to excuse the irregularity of method with which I put my thoughts on paper.

I have the honour to be,

SIR,

Your most obedient Servant,

WILLIAM DYCE.

Aberdeen, June 1, 1803.

CHARLES TAYLOR, Esq.

CERTIFICATES accompanied this Letter, from Messrs. Tennant, Knox, and Co. of Glasgow, preparers of oxygenated muriatic acid, stating,—that

Dr. Dyce's Manganese is equal to that either from Devonshire or America; and one from Mr. James Ferguson, of Aberdeen, testifying it to be as good as that obtained from London, which cost about £10 per ton.

The

The GOLD MEDAL of the Society was this Session voted to Mr. MATTHEW GREGSON, of Liverpool, for his very great attention to render useful the Articles remaining after public Fires. The following COMMUNICATIONS were received from him, and he has also favoured the Society with Impressions from a Wood Engraving, printed with Ink made from such burnt Articles; which Engraving is annexed. Specimens of the Applications of the burnt Materials to various purposes, referred to in this Account, are placed in the Society's Repository for the inspection of the Public.

SIR,

FEELING as I do for the sufferings of many of my townsmen and friends, on account of the dreadful fires

that have lately happened in Liverpool, I am anxious to make myself useful to them, and not unworthy of the notice and regard of the Society for the Encouragement of Arts, &c. I had the honour to be introduced to this Society by a friend, in the year 1801, and was much gratified by the laudable public spirit which that Society displays in promoting the interests of mankind. Upon being presented, at their Meeting, with a piece of paper made of *straw* or *paut*, I was greatly impressed with an idea, of *how much might be made of many articles apparently of no value.* This idea I have never lost sight of since, and in consequence of it now trouble you with these papers.

I was not present at the dreadful fire in Liverpool, in September last, when so many large warehouses were burnt to the ground, and the greatest part of their contents destroyed to an immense amount, as will be shown hereafter; but

but I have herewith enclosed as correct a list as I could obtain, and I believe nearer the truth than any that has yet been made public.

I returned home about ten days after the accident; the ruins yet smoking, and the articles still burning. The first time I went to the spot, I collected the following specimens, a part of which accompany this letter. I wish I had collected a greater quantity; but the present will, I trust, be sufficient to establish the facts I have to offer.

No. 1, is burnt Sugar, marked S. B. or Sweet Black.
2, is burnt Wheat, ——— V. B. or Vegetable Black.
3, is burnt Rice, ——— R. B. or Rice Black.
4, is burnt fine American Barrel Flour.
5, is burnt Cotton.

These are accompanied with an account of the amount and sales of the damaged articles of every description, which produced, as nearly as can be estimated, £13,050. 2s. 0d.

I have likewise attempted an estimate of what might have been still further saved to individuals, and to the public, to *Insurance Offices*, &c. &c. if the plan I have since formed had been then adopted. On the article of grain only, I estimate the saving to be forty-four thousand pounds more than was recovered, which is far more than three times the sum on this one article alone; and I conclude this saving to be nearly as much again upon rice, sugar, molasses, cotton, coffee, hemp, &c.

Fully impressed with this idea, I wish to make known for the public benefit, through the medium of this honourable and distinguished Society, to whom artists, manufacturers, agriculturists, and the commercial world owe so much, my invention for converting those ruins after a fire to the most useful purposes, preferring, as I do, any *honorary* reward the Society may confer upon me, to any pecuniary emolument which I might

might obtain by the concealment of a *simple* experiment.

The simplicity of the conversion of a useless to a valuable article will be highly approved, as I conceive, by the Society. It will require but few words to explain it; for, like the egg experiment of Columbus, it need but be pointed out to be understood. That it was not thought of before, is to me astonishing; and I very much wonder, that hundreds who saw the ruins did not attempt something for the recovery in part of this valuable property, which was consigned to the dunghill, or carried away by the tide.

No. 1.—The burnt sugar was reduced to a fine powder, and was tried as a water-colour paint. A specimen is enclosed, marked at the corner S B. As a *varnish ground* it is used, and marked S B; but as an *oil colour* it is used upon mahogany, and the sample marked S. It was again tried as a *printing-ink*.

Specimens

Specimens of this also are enclosed, and of a wood-cut of Bewick's, with a dedication to the Society.

No. 2.—Burnt wheat was only reduced to a fine powder. *Water-drawing* is marked V B. *Varnish colour* is grounded, marked on the back V B. Oil colour marked V on mahogany; and as a printing ink marked V B.

My painter not having the least knowledge of what he was using, gave it as his opinion, that either of them are preferable to ivory or lamp-black; that they have a good body in oil, and spend freely in water.

He likewise further states, that the vegetable black, as I call it, is of a stronger body, and of the two, is the best black in oil, being a solid good colour, and drying very rapidly. He prefers the S B, or sweet black, in varnish; and in water, he conceives it to be a better, warmer, and richer colour than any Indian ink he ever used; and

it

it much resembles that article, working full as freely, and spending equally well.

Among these specimens, that marked R B dries better than that marked V B. There are also larger specimens of that article sent, these having been collected from a later fire than the Goree fire.

No. 4 is a specimen of American fine flour, which when dug up was in the form of the cask, the same being burnt, and the flour left brown. The first piece I saw I thought was stone. I have converted a part of it into brown powder for hair, which is not very fashionable at present, or it would have answered. However, contrary to my expectations, on pounding it fine, and boiling it in water, I find it makes an excellent paste. It will also answer all the purposes of paste for manufactories. This was really quite contrary to my expectations. I have pasted some tea-paper over an old newspaper, and enclosed

closed it, which will prove my assertions to be good.

Some of the grain was not sufficiently burnt, for it fermented, when carried to the dunghill; but I have no hesitation in affirming that the timber and charcoal on the premises was sufficient to have calcined the whole of the grain in a manner suitable for a basis for black *water colour*, *varnish-black*, *black oil colour*, or *printing ink*, to all which purposes the materials are so very applicable, and so easily converted.

That corn, when charred, is incorruptible, is a fact that was known to the ancients; and if so, there can be little doubt but the colour will be durable. It is not in my power to say whether it may be used for dying; but I am inclined to think that the Chinese make Indian ink of rice, or some vegetable black.

I have yet made no experiments on the cotton, being so actively employed in

in my own business. I have sent a sample, and have some intention of trying how far I can succeed with that, and rice, which I have tried in water colour only.

I shall be glad to be honoured with a letter from you, and to be informed, if what I have written and sent is approved by the Society.

I am, Sir,

Your most obedient servant,

MATTHEW GREGSON.

Liverpool, March 15, 1803.

CHARLES TAYLOR, Esq.

SIR,

I HAVE sent by Higginson's waggon, on the 21st inst. fourteen lbs. of burnt Rice, also some sweated Rice, and burnt Cotton; the first, I am informed, will cost at the utmost 8s. per cwt. for grinding. Manganese is ground here for

for the bleachers use, at 30s. per ton, which I presume is a harder substance. I have enclosed you a sample of Manganese so ground.

My painter tells me, that for the representation of oak, he knows no colour equal to B, without any figuring or dashing of which, as a glazing colour upon a white ground, it is very applicable.

This will be best exemplified by a sample painted on a board marked B, on which there are three patterns painted, all produced from burnt rice, more or less burnt, or more or less covered on.

R B is rice black, S B is sugar black, V B is wheat black, the plain board is V B varnished, and Mr. Thomas Gill's letter accompanies the board; he made the Water Sketches I before sent, but knows not the composition of any of the colours. We have frequent cargoes of grain and flour destroyed, or rendered of little value, in long voyages, by heating;

ing; the value of these may be increased by a conversion to these useful purposes, and the drying quality will recommend their use, as lamp-black is much objected to for being a slow drier.

I am, Sir,

Your humble Servant,

MATTHEW GREGSON.

Liverpool, April 26, 1803.

CHARLES TAYLOR, Esq.

SIR,

HAVING made the necessary trials in oil and varnish, with the samples of black you sent me for that purpose; it appears to me, that the black marked V B on the pattern-board is the best both in point of colour and quickness of grinding. In strength of colour it equals the ivory-black now in use, and is superior to the lamp-black; with regard to body, it is much greater than the former, and at least equal to the latter

latter colour; it likewise dries well, and will be perfectly hard in eight hours with good boiled oil; in this point it is superior to the lamp-black, the latter being a very slow drier, and occasioning much trouble to the consumer; in short, when well pulverized and cleansed, it will in my opinion prove a great acquisition to the trade, provided it can be manufactured cheap enough to come into general use. The other blacks, S B and R B, possess nearly the same properties, but are deficient in colour; they might, however, come into use as preparatory colours to any dark-coloured work.—The brown appears capable of a still farther improvement by sifting, washing, &c. as it contains gritty particles, that render it very difficult to grind; and when ground and spread out by the brush, these particles are visible on the surface, which gives it a sandy appearance. It can only be made use of as a glazing colour, owing to want of body; it

it has, however, a good dr ing quality, and might often be substituted for the Terra de Sienna, when cleansed from the particles alluded to above.

I have likewise made trials of the blacks as water-colours, and find the S B preferable to the rest; it is a very good warm colour for a wash, and works very free. For mellowness of tint, I think it equal to Indian ink.

The brown is also an excellent wash, of a good tint, working very fine; but seeming to want strength, it may be improved in this way, when cleared from the sandy particles mentioned above, as they at present hurt its lustre and diminish its strength.

I remain, Sir,

Your obedient Servant,

THOS. GILL.

Feather-court, Richmond-row,
Liverpool, April 26, 1803.

To Mr. MATT. GREGSON.

The following CERTIFICATES were also received :—

From Mr. W. Redmore Bigg, No. 123, Great Russel-street ; stating, that he had sent a slight painted sketch as a specimen of it ; that it appears to him a strong and deep black, and he thinks stronger than ivory-black ; that it works free, and produces a clean and clear colour with white, and no doubt will work equally well with other colours ; that he has used the drying oil with it, and it dries very well.

From Mr. J. B. Brooks, No. 21, Old Bond-street; stating, that having printed some paper in the usual manner of paper-staining in size, with the simple black marked V B, he found it to be a better colour than blue-black or lamp-black, which are generally used, and he thinks it will answer better for printing than either ; has sent some of the

the paper printed with Mr. Gregson's sample.

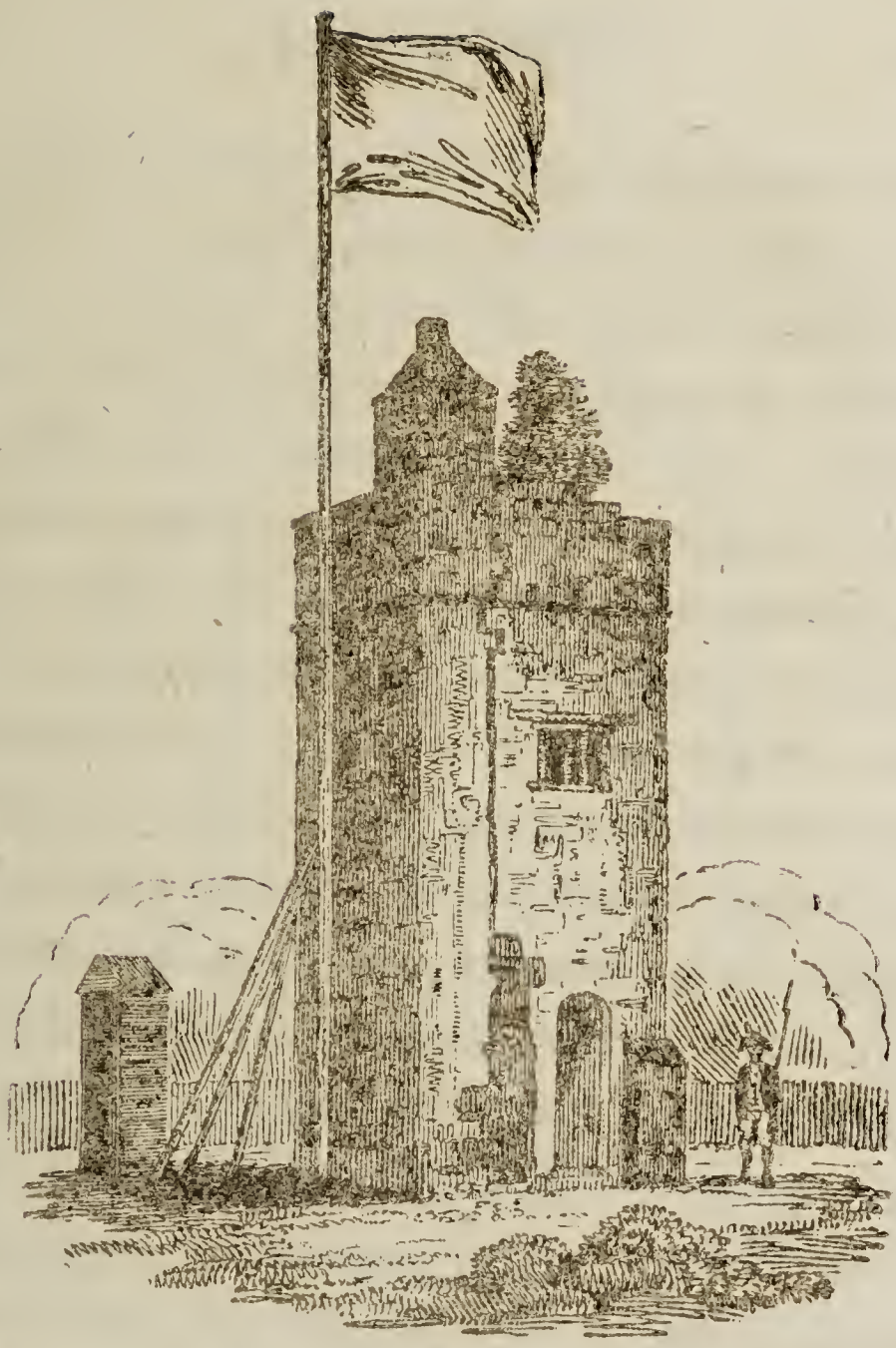
From Mr. John Tootle, paper-stainer; stating, that the vegetable-black, sent him by Mr. Gregson, would answer every purpose for a black in their manufactory, and particularly so for laying grounds for black borders; as it has more body than lamp-black, and will cover the ground with one colouring, but that with lamp-black they are obliged to colour twice.

From Mr. Henry Buckley, No. 161, Strand; stating, that on trial of the black produced from burnt wheat, he found it to possess a much stronger body than the generality of blacks now in use; and that it has an additional valuable property of drying without any other auxiliary than the boiled oil in which it is ground; that this quality adds considerably to its utility, as the

common blacks are frequently dried with great difficulty, even with two or three chemical dryers, and the use of boiled oil in addition.

Some farther remarks and calculations were added by Mr. Gregson, to show that burnt grain will answer the purposes of charcoal in various smelting works, and that the burnt grain carted from Goree fire, at Liverpool, which sold for only £322. 14s. would have produced £10,000, if applied to the uses of charcoal.

The



M. G. del. H. H. sc.

THE ANCIENT FIRE-BEACON,

NEAR LIVERPOOL.

This Specimen is printed by J. M'Creery of Liverpool, with Ink made from Corn, burnt at the Great Fire in Liverpool, September, 1802.

The above Engraving has been executed for the intended History of Liverpool.

In preparing the tan forming the specimen sent, I, according to the principles laid down by Mr. Seguin, divided four hundred pounds of Mangrove Bark (broke into small pieces), into three equal parts, one of which was thrown into each of the three highest cisterns.

To the Bark in the uppermost cistern one hundred gallons of rain water was added, which was allowed to remain for twelve hours. The infusion was then drawn off into the second, and after standing for a similar period into the third, and lastly into the fourth, which had been kept empty to receive the saturated infusion, to be farther concentrated by evaporation. The cocks belonging to each cistern, when once turned, were left open to admit of the infusions draining off completely.

The whole of the liquid now collected into the evaporating cistern was exposed to the heat of the sun, until concentrated so as to resemble thick syrup, at which time the lixivium was reduced

to about eight gallons. It was then drawn off clear from its precipitate into a copper boiler, in which it was boiled on a slow fire, and kept constantly stirred, until the extract acquired a consistence that would just admit of its being poured into the barrel, where on becoming cool it had the appearance of pitch, which it still retains. When the infusion had acquired the thickness of syrup, I found the use of fire, for giving the necessary consistence to the extract, preferable to waiting the farther progress of evaporation, that being in a great measure suspended by the successive formation of tough coats on the surface of the liquor.

I have the honour to remain,

SIR,

Your most obedient servant,

JAMES HOWISON.

No. 332, Strand,
London, April 28, 1804.

CHAS. TAYLOR, Esq.

Dr.

Dr. Howison has made a similar extract from Myrabolans, which is likely to be extremely useful, both for tanning and dying.

The

The SILVER MEDAL of the Society was this Session voted to J. MACHLACHLAN, Esq. of Calcutta, for his information on the MINES and MANUFACTURES of the EAST INDIES.—The following COMMUNICATION was received from him, and SPECIMENS of the TALC are preserved in the Society's Repository.

SIR,

SHOULD you think the enclosed Receipts for dying the beautiful Reds of the Coromandel Coast can be of any use to the dyers of the United British Kingdom, be pleased to lay them before the Society for the Encouragement of Arts, &c. that they may be published in the Volume of their Transactions; if not, I trust you will excuse my troubling you with them. They were sent to me from Madras by a scientific

The GOLD MEDAL of the Society was this Session adjudged to Dr. JAMES HOWISON, for his Preparation of TAN, made in the East Indies from the BARK of the MANGROVE TREE. The following COMMUNICATION was received from him, and SPECIMENS of the Preparation are placed in the Society's Repository.

SIR,

I REQUEST the favour of your submitting to the inspection of the Society the preparation of tan, contained in the accompanying barrel, weighing fifty-four pounds.

I entertain hopes, that from its concentrated form and cheapness, it will fully answer the expectations of the Society, and that they will consider me as entitled to the Gold Medal offered by them for that preparation.

The enclosed bills of lading will, I hope, be sufficient documents of one

hundred and ten pounds having been prepared by me. The specimen of fifty-four pounds, now sent, cost me about eight shillings in Bengal; but if the demand for the article be considerable, it could be procured for ten shillings the hundred weight.

The method followed by me in its preparation being very simple, and such as is applicable for extracting the tanning principle from vegetables on the most extended scale, I hope that a short account of it will be acceptable to the Society.

In extracting the tanning principle from the Mangrove Bark, I made use of part of an apparatus which I had formerly employed in refining saltpetre.

This consisted of four wooden cisterns, resembling the coolers used in brew-houses, fitted with cocks, and sufficiently elevated one above another, to admit of any liquid, contained in a higher cistern, running off into that immediately under it, on turning the cock.

In

entific friend, who had the several operations, detailed in them, performed in his own presence. I forwarded a copy of them, and a small quantity of the ingredients mentioned in them, to a friend at home, several years ago; but he dying about or soon after the time of their arrival, I never learned what became of them. It strikes me, however, that there is a considerable coincidence between the thread process and that which I have seen recommended by Mr. Henry, of Manchester, for dying the Adrianople or Turkey red.

I am not certain whether it is known at home, that many of the hills in Bahar, and other parts of India, contain immense quantities of mica, talc, or Muscovy glass. The natives of this country and China make very splendid lanterns, shades, and ornaments, of it, tinged of various fanciful colours; and it is also used by them in medicine. When burned or calcined, it is, Iam told, considered

sidered as a specific in obstinate coughs and consumptions. When powdered, it serves to silver the Indian paper, &c. used in letter-writing; and, in fact, it is applied to numberless purposes.—The bazar price of that of the best quality, split into sheets of about two lines thick, is six rupees the maund of 84lb. avoirdupois. If it could be applied to any useful purpose at home, it might go in part ballast of ships, and at a trifling expense. I enclose a small specimen of it, and am,

SIR,

Your very obedient Servant,

J. MACILACHLAN.

Calcutta, Oct. 4, 1803.

N.B. The chaya, or red dye root of the Coast, is, I believe, known at home; as also the cashaw leaves, which are used as an astringent.

CHARLES TAYLOR, Esq.

Directions

Directions for dying a bright red, four yards of $\frac{5}{4}$ Broad Cotton Cloth.

1st. The cloth is to be well washed and dried, for the purpose of clearing it of lime and congee, or starch, generally used in India for bleaching and dressing cloths; then put into an earthen vessel, containing twelve ounces of chaya or red dye root, with a gallon of water, and allow it to boil a short time over the fire.

2d. The cloth being taken out, washed in clean water, and dried in the sun, is again put into a pot with one ounce of myrabolans, or galls coarsely powdered, and a gallon of clear water, and allowed to boil to one half: when cool, add to the mixture a quarter of a pint of buffalo's milk. The cloth being fully soaked in this, take it out, and dry it in the sun.

3d. Wash the cloth again in clear cold water, and dry it in the sun; then immerse

immerse it into a gallon of water, a quarter of a pint of buffalo's milk, and a quarter of an ounce of the powdered galls. Soak well in this mixture, and dry in the sun. The cloth, at this stage of the process, feeling rough and hard, is to be rolled up and beetled till it becomes soft.

4th. Infuse into six quarts of cold water, six ounces of red wood shavings, and allow it to remain so two days. On the third day boil it down to two-thirds the quantity, when the liquor will appear of a good bright red colour. To every quart of this, before it cools, add a quarter of an ounce of powdered alum; soak in it your cloth twice over, drying it between each time in the shade.

5th. After three days wash in clean water, and half dry in the sun; then immerse the cloth into five gallons of water, at about the temperature of 120 degrees of Fahrenheit, adding 50 ounces of powdered

dered chaya, and allowing the whole to boil for three hours; take the pot off the fire, but let the cloth remain in it until the liquor is perfectly cool; then wring it gently, and hang it up in the sun to dry.

6th. Mix intimately together, by hand, about a pint measure of fresh sheep's dung, with a gallon of cold water, in which soak the cloth thoroughly, and immediately take it out, and dry it in the sun.

7th. Wash the cloth well in clean water, and spread it out in the sun on a sand-bank (which in India is universally preferred to a grass-plat) for six hours, sprinkling it from time to time, as it dries, with clean water, for the purpose of finishing and perfecting the colour, which will be of a very fine bright red.

J. Machlachan.

Calcutta, Oct. 4, 1803.

Charles Taylor, Esq.

Directions

Directions for dying of a beautiful red, eight ounces of Cotton Thread.

1st. Put one gallon and a half, by measure, of sap-wood ashes, into an earthen pot, with three gallons of water, and allow the mixture to remain twenty-four hours to perfect it for use.

2d. Put the following articles into an earthen pot, viz. Three-quarters of a pint of Gingelly oil; one pint, by measure, of sheep's dung, intimately mixed by hand in water; two pints of the above ley.—After mixing these ingredients well, pour the mixture gradually upon the thread into another vessel, wetting it only as the thread, by being squeezed and rolled about by the hand, imbibes it, continuing to do so until the whole is completely soaked up, and allow the thread to remain in this state until next day.

3d. Take

3d. Take it up, and put it in the sun to dry; then take a pint and a half of ash-ley, in which squeeze and roll the thread well, and allow it to remain till next day.

4th. Squeeze and roll it in a like quantity of ash-ley, and put it in the sun to dry; when dry, squeeze and roll it again in the ley, and allow it to remain till next day.

5th. Let the same process be repeated three or four times, and intermit till next day.

6th. Ley the thread once, as the day before, and, when well dried in the sun, prepare the following liquor: One gill of Gingelly oil; one pint and a half of ash-ley.—In this squeeze and roll the thread well, and leave it so till next day.

7th. Repeat the process of yesterday, and dry the thread in the sun.

8th. The same process to be repeated.

9th. First repeat the ash-ley process three or four times, as under the operations 3, 4, and 5, and then prepare the following mixture: One pint of sheep-dung water; one gill of Gingelly oil; one pint and a half of ash-ley.—In this squeeze and roll the thread well, and dry it in the sun.

10th. Repeat the same process.

11th. Do. Do.

12th. Do. Do.

13th. Do. Do.

14th. Do. Do.

15th. Wash the thread in clean water, and squeeze and roll it in a cloth until almost dry; then put it into a vessel containing a gill of powdered chaya root, one pint by measure of cashan leaves, and ten pints of clear water; in this liquor squeeze and roll it about well, and allow it to remain so till next day.

16th.

16th. Wring the thread, and dry it in the sun, and repeat again the whole of the 15th process, leaving the thread to steep.

17th. Wring it well, dry it in the sun, and repeat the same process as the day before.

18th. Do. Do.

19th. Do. Do.

20th. Wring and dry it in the sun, and with the like quantity of chaya root in ten pints of water, boil the thread for three hours, and allow it to remain in the infusion until cold.

21st. Wash the thread well in clear water, dry it in the sun, and the whole process is complete.

J. MACLACHLAN.

Calcutta, Oct. 4, 1803.

The THANKS of the Society were this Session voted to Dr. JAMES HOWISON, for the following COMMUNICATION of a METHOD of DYEING or PRINTING a permanent substantive BLACK COLOUR on COTTON GOODS, in the East Indies. A Handkerchief so printed remains in the Society's Repository.

SIR,

ACCOMPANYING this, I send, for the inspection of the Society, a Handkerchief printed with a substantive Black; a discovery which, I hope, will be of some assistance to the improvement of the arts.

The irregularity of the figures is entirely owing to the rude carving of the Indians, as will be seen from some of the flowers being distinctly marked.

As I am much indebted for my success to the hints I received from a perusal

rusal of Dr. Bancroft's very instructive Work on the Philosophy of Colours, I hope the Society will condescend to lay the specimen before him, that his opinion may be known, how far a prosecution of the business is likely to answer the purpose intended.

The printing blocks used were carved by the natives of Bengal, at which place the handkerchief was printed.

I have the honour to be,

SIR,

Your obedient Servant,

JAMES HOWISON.

No. 332, Strand, Oct. 15, 1803.

CHAS. TAYLOR, Esq.

Process for printing on Cotton Cloth a permanent substantive black colour.

Take some Malacca nuts, of which large quantities may be bought in Bengal at 2s. the cwt.; boil them in water in close earthen vessels, along with the leaves of the tree; during the boiling, a whitish substance, formed from the mucilage and oil of the nuts, rises to the surface, which whitish scum must be taken off and preserved.

The cloth, where intended to be black, must be printed with this scum, and then dried; the cloth is afterwards to be passed through lime-water, which changes the printed figures on it to a full and permanent black.

PAPER

IN

POLITE ARTS.

POLITE ARTS.

The SILVER MEDAL of the Society was this Session voted to JOHN CHURCHMAN, Esq. Member of the Imperial Academy of Sciences at St. Petersburgh, for his GEOGRAPHICAL and TOPOGRAPHICAL IMPROVEMENTS.

The following COMMUNICATION was received from him, and an explanatory ENGRAVING is hereunto annexed.

SIR,

I REQUEST you to lay the following Essay on the Improvement of Geography before the Society for the Encouragement of Arts; and, in so doing, you will much oblige

Your most obedient servant,

JOHN CHURCHMAN.

No. 5, John-street, Tottenham-court-road,
March 8, 1804.

CHARLES TAYLOR, Esq.

It

It appears to be a matter of much importance to the people of any country, at all times, whether in war or peace, to possess a complete knowledge of its surface. In war, such knowledge is absolutely necessary for defence; in peace, for improving the country to the best advantage.

Now, since Geography may be improved, an easy and accurate method to lay down maps of mountainous countries and hilly estates, will perhaps prove useful, as it will show at a single view the true shape and comparative height of the ground without the art of painting.

As mountains are apt to eclipse each other, a perspective view is seldom very extensive, the rules of which fall short of giving an accurate idea of any hilly country; because such a view, though strictly true in one particular place, is not so in any other. The altitudes

tudes of mountains appear in proportion to the distance from the eye, and no rule in geometry has been found sufficient to determine distances from any single station. Neither can a bird's-eye view of an estate ascertain the depth of valleys or the height of mountains. But the method here proposed will be found equally capable of giving the true shape of any ground above or below water. It may be successfully applied to sea charts, and will prevent much confusion, arising from the tedious method of distinguishing soundings by a multitude of figures.

EXPLANATION.

Suppose a full description is required of any island in the ocean. First, let an accurate map be laid down in the common way; and let the perpendicular height between the highest point of land and the ocean be divided into any number of equal parts. Suppose these equal

equal divisions are 100, 200, 300, 400 feet above the low-water mark. From the different points of these several divisions, let horizontal lines be run with a good theodolite, and spirit level annexed, all round the island. If the work is well done, each line will end where it began; and if the bearings and distances of these several lines are truly laid down on the map, the crooked courses of them will clearly show the shape of the ground over which they pass. For example: if any horizontal line passes by the side of a steep hill, it will incline towards the ocean, or approach the next horizontal line below it. When the same line crosses a stream of running water or a valley, it will naturally bend up the side of the said stream, until it can cross it without losing the level; or, in other words, it will bend towards the centre of the island. Hence, by a little practice, the shape of the several horizontal lines on

the

Mr. Churchman's

Topographical Plan.

the map will give as clear an idea to the mind, of the shape of any country over which they pass, as a sight of the country itself can convey to the eye. But to obtain a mathematical and true knowledge of the altitude and declivity of any part of the country, we have the following proposition:—

As the perpendicular height of any one horizontal line above another is to the radius: so is the horizontal distance between the horizontal lines measured on the map at any particular place: to the co-tangent of declivity at that place.

Note.—If the horizontal distance between any two horizontal lines on the map is equal to the perpendicular height of any horizontal line above another, the angle of altitude, or declivity, of any hill will be 45 degrees.

The present improvement, which I believe to be entirely new, will be found to possess the following advantages:—

1st. Military men are well acquainted with

with the many advantages always to be gained from the exact representation of high grounds. By this method, we are able to give the angle of altitude, the angle of declivity, and perpendicular height of every hill; likewise the comparative height of different hills, the best route by which the high grounds may be gradually ascended, and where heavy burthens can be drawn up with most ease.

2dly. Experience has sufficiently shown, that the inhabitants of low grounds are subject to different kinds of sickness, from which those living at places elevated to a certain degree are exempt. A map on this improved plan will point out the most proper situation for building dwelling-houses. It will be useful in Botany, in discovering or cultivating some kinds of plants which flourish best at particular distances above the level of the ocean. It will trace the line of vegetation on the sides

of

of lofty mountains, whose tops are covered with eternal snow.

3dly. Some high lands are known to produce good grain, while low lands afford grass more abundantly; but most grounds produce good grass, over which a moderate quantity of running water is conveyed. A plan of any country in this way will show all the ground that can be irrigated; where water-works may be erected; where navigable canals may be cut; and where highways and rail-roads may be laid out on the best and most level ground.

4thly. The subterraneous treasures of the mineral and fossil kingdoms are generally found in strata; and if they are not truly horizontal, they make a certain angle with the horizon. A map on this projection may enable the mineralogist to follow any one stratum, at places even far distant from each other.

PROBLEM.

PROBLEM.

To find the true declivity of any piece of ground, in any map laid down on the principles of the present plan.

Example 1st. for D. see plate 4.

As the perpendicular height, 4 feet -	60206
Is to radius, 90° - - - -	10.00000
So is the horizontal distance, 4 feet -	60206
	10.60206
To the co-tangent of the declivity, 45°	10.00000

Example 2d. for B.

As the perpendicular height, 4 feet -	60206
Is to radius, 90° - - -	10.00000
So is the horizontal distance, 8 feet -	90309
	10.90309
To the co-tangent of the declivity, 26° 34′ - - - -	10.30103

Example 3d. for C.

As the perpendicular height, 4 feet -	60206
Is to radius, 90° - - - -	10.00000
So is the horizontal distance, 18 feet	1.25527
	11.25527
To the co-tangent of the declivity, 12° 32′ - - - -	10.65321

The

The annexed survey, Plate IV. of a small lake and artificial mountain in the garden of his Excellency Count de Strogonoff, near St. Petersburgh, has been closed by the tables of the difference of latitude and departure, as follows:

		N	S	E	W
N 30 E	$2\frac{1}{2}$	2.2	—	1.2	—
N 35 E	2	1.6	—	1.1	—
N 75 E	2	.5	—	1.9	—
N 55 E	2	1.1	—	1.6	—
N 45 E	3	2.1	—	2.1	—
N 52 W	2	1.2	—	—	1.6
N 59 W	3	1.5	—	—	2.5
S 56 W	12	—	6.7	—	9.9
S 60 E	7	—	3.5	6.1	—
		10.2	10.2	14.0	14.0

PAPERS

IN

MANUFACTURES.

MANUFACTURES.

A Bounty of TWENTY-FIVE GUINEAS was this Session voted to Mr. JAMES BIRCH, of Tavistock-Mews, Tavistock-street, Tottenham-Court-road, for his Improvement of a SWIVEL LOOM, to weave Satin Guard or figured Laces; a Model of which, and Patterns of the articles wove, are reserved in the Society's Repository, for public inspection.

The following COMMUNICATION was received from him.

SIR,

UNDERSTANDING that the Society of Arts is established to promote the arts and manufactures of this country, I take the liberty of informing you, that, after two years trouble and much expense, I have brought to perfection a new-invented Figure Swivel

Loom, that makes the satin guard lace, or any other figured lace, in as easy a manner as a common swivel loom can make the common work in the usual way. The above-mentioned Loom is a complete piece of machinery, and I presume is worthy of notice, being an entire new invention.

Any Member of the Society may see the above Loom at work, by applying at my house.

I am, Sir,

Your obedient humble servant,

JAMES BIRCH.

December 6, 1802.

CHARLES TAYLOR, Esq.

Description of Mr. BIRCH'S *Loom.*

This Loom is worked by a circular motion of the hands, without treadles or any application of the feet. A wood bar to which the hands are applied, works two cranks on a long iron axle, extending the width of the loom; one

one crank is near each end of the above axis, a fly wheel is attached to one of the ends of the axis, to regulate the motion of the machinery; an endless screw, placed upon the axis, works a star wheel underneath it, which turns a barrel, that has a resemblance to that of a hand-organ, and has wooden pegs fixed in different parts around it: these pegs catch upon levers, which draw forward the cords which form the figure, and pull them down by a claw, which secures the cords thus brought within its power, and by that means raise the upper geer connected with the cords.

In this Loom, fourteen pieces of satin guard, or bed lace, are wove at the same time, either of one pattern and breadth, or all of different patterns and breadths, as may be required. The figure may be extended to any number of shoots desired.

The Loom takes up no more space than a common swivel loom, such as is

employed in plain work; it appears to work with ease and expedition, to make good work, and to be easily managed. It does not break or chafe the silk during its working. The weaver can move to any part of the front of the loom to inspect the work, and continue the motion during that time, and the figure or pattern may be formed double the length of those usually done in the engine loom; the loom can be stopped when required at any one shoot of the shuttle; and it will answer to weave articles made of silk, wool, cotton, or linen, or mixtures of those articles, or gold and silver lace; and performs its work in half the time of an engine loom.

A common swivel loom costs about thirty pounds; and this invention may be added to it for six pounds more.

A Certificate

A Certificate from Mr. Thomas Ikin, of Maiden-lane, manufacturer, states,—that James Birch is the sole inventor and maker of the above Swivel Loom; that it makes different sorts of figured lace at one time, in silk, cotton, worsted, or thread; and that by this Loom the above-mentioned work may be made at considerably reduced prices, to what it can be done in any other loom.

Certificates also from Matthew Birch, William Rylance, and Issachar Thorpe, weavers, confirm the above statement as an undeniable fact.

A Bounty

A Bounty of TWENTY GUINEAS was this Session voted to Mr. JAMES PICKARD, of No. 32, Skinner-street, Bishopsgate-street, for an improved ENGINE LOOM, to make Satin Guard, &c. a Model of which is placed in the Society's Repository, for public inspection.

The following COMMUNICATION was received from him.

SIR,

MY improved Engine Loom, to make Satin Guard, &c. will stand in a room that is only six feet high; whereas in the old way a ceiling of nine feet high was frequently obliged to be cut through, to enable the loom to work. A man may weave one-third more work in this than in the old engine loom, and with less fatigue. It requires not one-fifth of the weight to work the treadles, nor

nor one-fourth of the motion of the legs to the treadles: it was formerly hard labour for a man, but it may now be worked with ease by a boy. In this Loom, he can see all his work clear before him, but in the old engine-loom he cannot. The Loom is now at work, and may be inspected.

I am, Sir,
Your humble servant,
JAMES PICKARD.

No. 32, Skinner-ſtreet, Feb. 1, 1804.

CHARLES TAYLOR, Esq.

Description of Mr. PICKARD's *Loom.*

This Loom weaves fourteen pieces of Satin Guard Lace at once: it is on a simpler construction than the old engine loom, which weaves the same article; and work can be done with it at less expense, and better. It does not appear to require half the weight of lead-work, or half the quantity of thread-work;

work; the tread is very easy; the threads of the warp slide through perforated glass beads; leaden rods are hung to these beads, by which means the threads of the warp, after being raised by the treadles and geer, are returned or brought down to their proper level after the shuttles are thrown.

Different patterns may be wove at the same time in this loom; a treadle is necessary to every shoot, and the figure may be worked of the length of ten shoots forwards, and nine backwards.

The cords in this Loom are much shorter than in the old engine-loom, and not so liable to contract or dilate by change of weather.

A loom on the old principle will cost sixteen or seventeen pounds, but on this plan only nine pounds, and it may be worked by a boy or girl of fourteen years of age.

Mr. Abraham Felton, foreman to Messrs. Clay and Smith, silk-manufacturers,

turers, Cheapside, gave it as his opinion, that Mr. Pickard's Loom is an improvement upon the old engine looms; is much more simple, and performs the work with less trouble; that it is put to work with much less expense; and he believes it will enable the weaver to do one-fourth more work with ease in the same time.

A letter from Mr. J. Stokes, silk-manufacturer, in Gutter-lane, certifies, that the Satin Guard Loom, invented and worked by Mr. Pickard, is entitled to a considerable degree of merit, as it relieves the person who works it from much exertion, the nature of which is very apt to injure the health; that men of all sizes are equally capable of working this Loom with ease and more expedition.

PAPERS

IN

MECHANICKS.

MECHANICKS.

The GOLD MEDAL of the Society was this Session voted to the Rev. DANIEL PAPE, of Penn, near Wolverhampton, for IMPROVING RYE HARBOUR.

The following ACCOUNT was received from him; and an ENGRAVING of the Plan, with a DESCRIPTION thereof, are hereunto annexed.

SIR,

I HEREWITH transmit you a Plan of a Dam and Cut executed at Rye, which, if you will have the goodness to present to the Society of Arts, for their approbation and bounty, you will very much oblige your obedient servant,

DANIEL PAPE,
Late Curate of Rye.

London, April 6, 1803.

CHAS. TAYLOR, Esq.

Memorial of Rye Harbour.

Rye Harbour, once so very safe and convenient for passing vessels up or down the channel, to run to in distress or in precarious weather, had been for many years, and from various causes, in a gradual state of decay, insomuch that in the years (I believe) 1795 and and 1796, it was thought necessary to send Captain ———, from the Trinity-House, to make a survey, and report to the Board its then state, and the probability of its improvement or redemption. The survey was made, I believe, with considerable care and attention; and the result was, that the harbour was pronounced lost, or in such an irreparable decayed state, that it was an useless expense to the ships passing, which paid tonnage to it; and therefore this tonnage was taken from Rye, and given to Ramsgate Harbour, leaving however a reserve

a reserve in the hands of the Commissioners of £6000.

The consequence of this was an advertisement, inviting any gentleman to come forward with plans for the improvement of the Harbour, and the draining of the upper Levels. On the day appointed for the presentation of such plans, a very sensible letter was laid before the Commissioners by the Rev. Mr. Jackson, of Rye, though impracticable on many accounts,—and also a plan by myself, proposing to make the present cut, and to form a dam of straw or hay and faggots, as represented on the chart, for the small sum of £500. On reverting to the *enormous sums* that had been already, from time to time, expended by able engineers to no purpose, it was judged at the moment an impossible attempt; and, after politely voting me their thanks, the Commissioners seemed to decline carrying their plan into execution.—

This, however, did not satisfy me; and therefore, confident of success, I undertook to perform what I had proposed, or lose the money, without stipulating for any fee or reward should I succeed. On entering upon this agreement, I set to work, and choosing a Mr. Southerden, an active and persevering man, as foreman, to assist me, I completed the work in three months, in the very depth of winter, at the expense of only £480. though the works were twice filled up with sea-beach by the tides. But, though this was done to the astonishment and admiration of many, yet there were evidently an envious few mortified and disappointed. The cut and dam being thus finished, it was then thought necessary, on my recommendation, to secure the cut from reverting to its late reduced state, by a pier-head on the East, and jutties on the West side of it; the execution of which was committed to the eminent skill of a Mr. Sutherland,

who

who performed the trust reposed in him, to the universal satisfaction of his employers; and I believe the whole was completed for something less than £3000, in a very masterly and workman-like manner. Of this I think there cannot be a better proof adduced, than that it still stands *firm*, without the least apparent decay, and maintains its first position without the smallest variation; and no doubt a very trifling annual expense will keep it in its present improved state.

The advantages derived from it are particularly great; for ships of 250 tons burden, and even vessels of 300 tons, run in with the greatest safety at spring tides; whereas, before, those of 50 tons could not come in, but with the utmost difficulty and danger.

That part of Romney Marsh too, which lies contiguous, and was threatened by every boisterous tide with a total overflow, is now in safety, and

the drainage of the levels is rendered complete.

I beg leave now to offer to your attention a short description of the Dam, the form and materials of which may be used with success in similar situations, whether in places adjacent to the sea, or in gentlemen's fish-ponds, or rivers in the country, where weirs may be necessary for the preservation of the banks. The dam was merely formed of hay, straw, and faggots, pinned down to a *foundation* of *sand* or *silt* by short piles. I formed it as in the chart, of the shape of a double-roofed house, first putting down straw, and then over it hazel faggots, from 12 to 14 feet in length, and afterwards pinning down the whole with piles. I next filled the space between the two roofs with gravel or sea-beach, and secured this also with faggots pinned down upon it, over which resistance being precluded from its peculiar form, the influx and reflux of

the

Pl.V

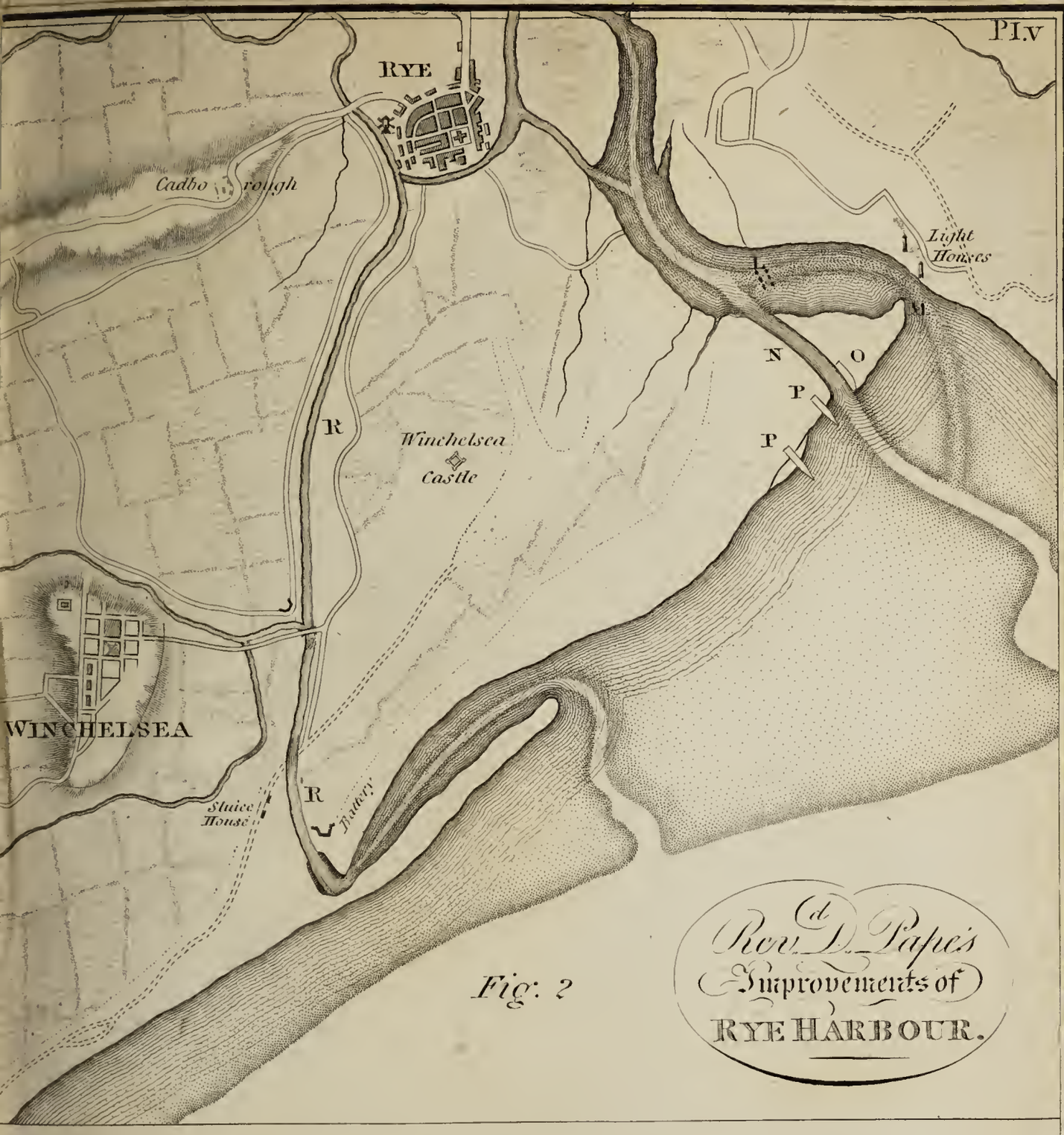
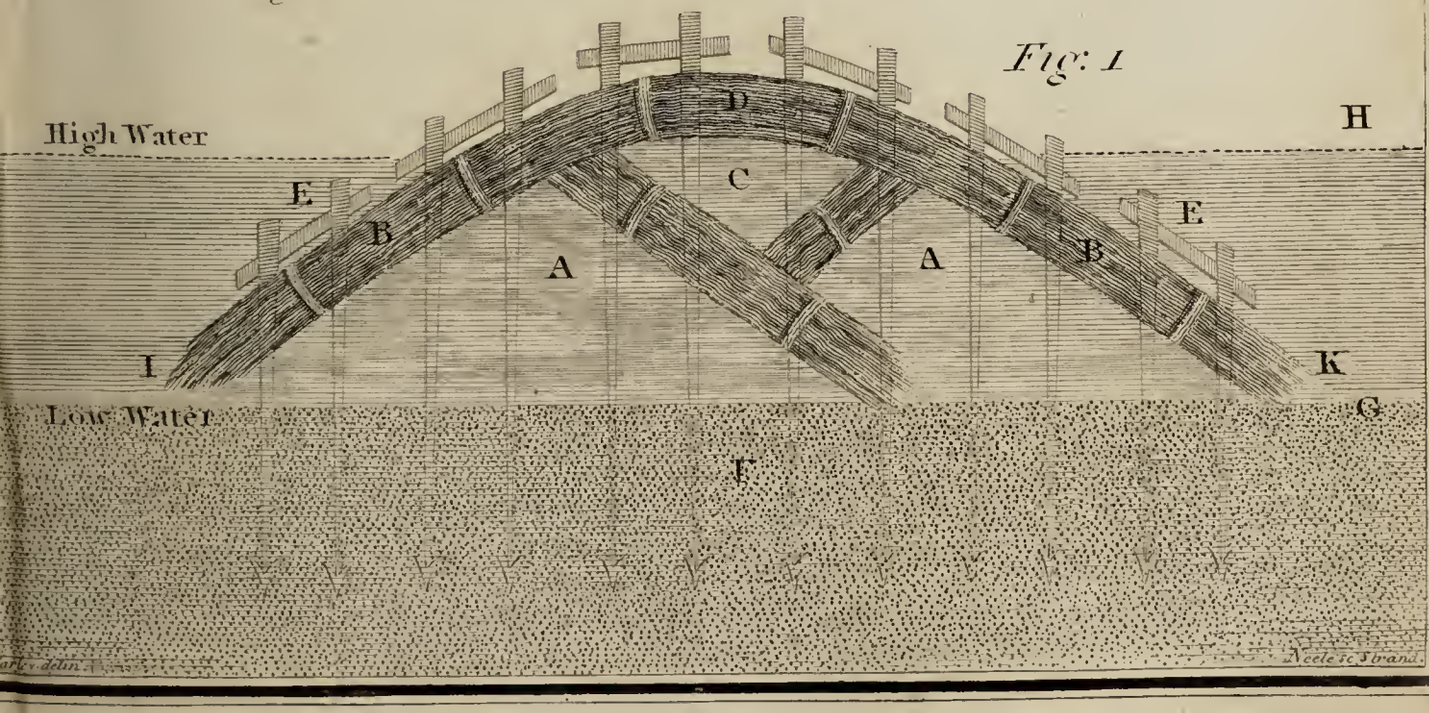


Fig: 2

Rev.d D. Papes Improvements of RYE HARBOUR.

Cross Section of Mr. Papes Dam.

Fig: 1



the tides glided so gently, that consequently every probability, not to say possibility, was annihilated of its being ever undermined or blown up.

It was also necessary that this dam should be put down in one tide, and that the mouth of the cut should be opened in the same time; for it was evident to me, that it was impossible ever to cut to sea in any other way. For unless the dam had been ready to turn the water through the cut as soon as opened, and the cut, on the other hand, ready to receive the current the moment the dam began to act, the whole work must have been entirely and unavoidably destroyed by the influx and reflux of the ensuing tide. All this I clearly foresaw; and by procuring a sufficient number of men, nearly three hundred, the business was completely finished, just as the tide touched the the foot of the dam; and when it was full sea, the straw of course acted as a

receiver and retainer to the *silt* brought in by the tide; which being repeated by each returning tide, the dam soon became entirely fixed, beyond a possibility of ever being destroyed; and it is now so entirely covered, that if the pier is kept in repair, the dam must ever remain unimpaired by time, and proof against the most violent floods of waters.

For this work, the Commissioners voted me fifty guineas (half of which I gave to my assistant), and alleged that, on account of the loss of the tonnage, and the poverty of the fund, they were sorry it was not more. This to me, under these circumstances, was a sufficient apology, and I was content. I now offer it to the consideration of the Society of Arts, as a body in some degree interested in the prosperity of this kingdom. Should they deem what I have already received an adequate compensation for such a work, and such

an

an undertaking, at so inclement a season, I am still content. But if they should think proper to grant me an additional remuneration, it will be received with peculiar satisfaction, and considered as a very great honour by,

SIR,

Your obedient humble servant,

DANIEL PAPE.

Cambridge, Trinity Hall, April 2, 1803.

CHARLES TAYLOR, Esq.

I HEREBY certify, that I occasionally lived at Rye, and am acquainted with Rye Harbour, and with the Rev. Mr. Pape, whose Memorial respecting the Cut and Dam at that place I have read, and believe what he has therein related to be strictly true.

DANIEL SLADE.

Three-Crown Court, Southwark, April 6, 1803.

Reference

Reference to the Engraving of the Rev. Mr. PAPE'S *Improvement of Rye Harbour, Plate* 5, *Fig.* 1.

AA. The double roof, filled with straw.
BBB. Hazel faggots, 12 to 14 feet long.
C. The space betwixt the roofs, filled with gravel or sea-beach.
D. The faggots which covered the gravel so laid.
EE. Piles of wood driven through the faggots and straw into the earth, at the bottom of the river, the heads of which piles are united by cross pieces of wood.
F. The solid bed of the river.
G. The river at low water.
H. The high-water mark.
I. The upper side of the dam, which opposes the current of the river.
K. The lower side of the dam, which resists the coming-in of the tide.
Fig. 2. L, Shows the place where the dam was placed.

M. The old course of the river represented by dotted lines, and which is now filled up with gravel by the tide.

N. The new canal, cut by Mr. Pape's directions, and which is now the regular chan el for shipping.

O. The pier-head, on the East side of Mr. Pape's cut.

PP. The two jutties, on the West side of Mr. Pape's cut.

RR. The former canal, cut under the direction of Mr. Smeaton, and other able engineers; but which failed, and is since blocked up by a bank made across it, over which the present high road between Rye and Winchelsea passes.

The GOLD MEDAL of the Society was this Session voted to Capt. JOSEPH BRODIE, of the Royal Navy, at Leith, for sundry MARINE IMPROVEMENTS, particularly for his method of connecting Iron Bars, and coating them with lead, so as to form solid pillars for Light-houses, on rocks covered at high water, without being subject to corrosion from the action of sea water.

An ENGRAVING of this Invention is hereunto annexed. A MODEL thereof, also of a cone or break-water, of cast iron, invented by him, are reserved in the Society's Repository.

SIR,

AS the meetings of the Society are now about to take place, I request you will have the goodness to present my models to them; the one, which is for a purposed Light-house, will show the

Fig. 1.

Captain Brodie's Method of coating Iron Bars.

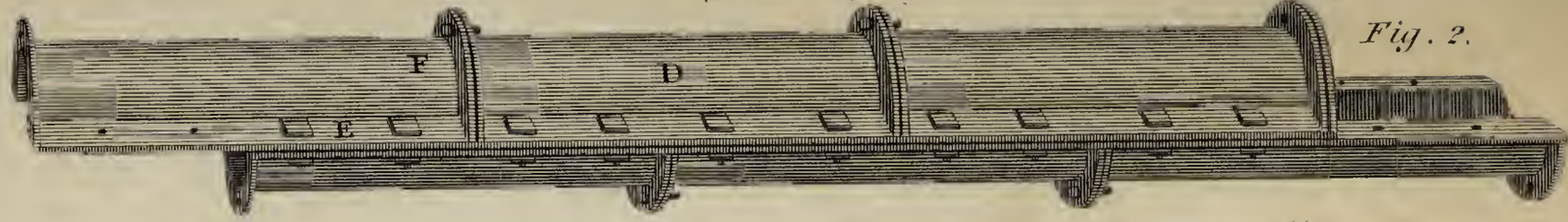


Fig. 2.

Mr. Rawlinson's Colour Mill.

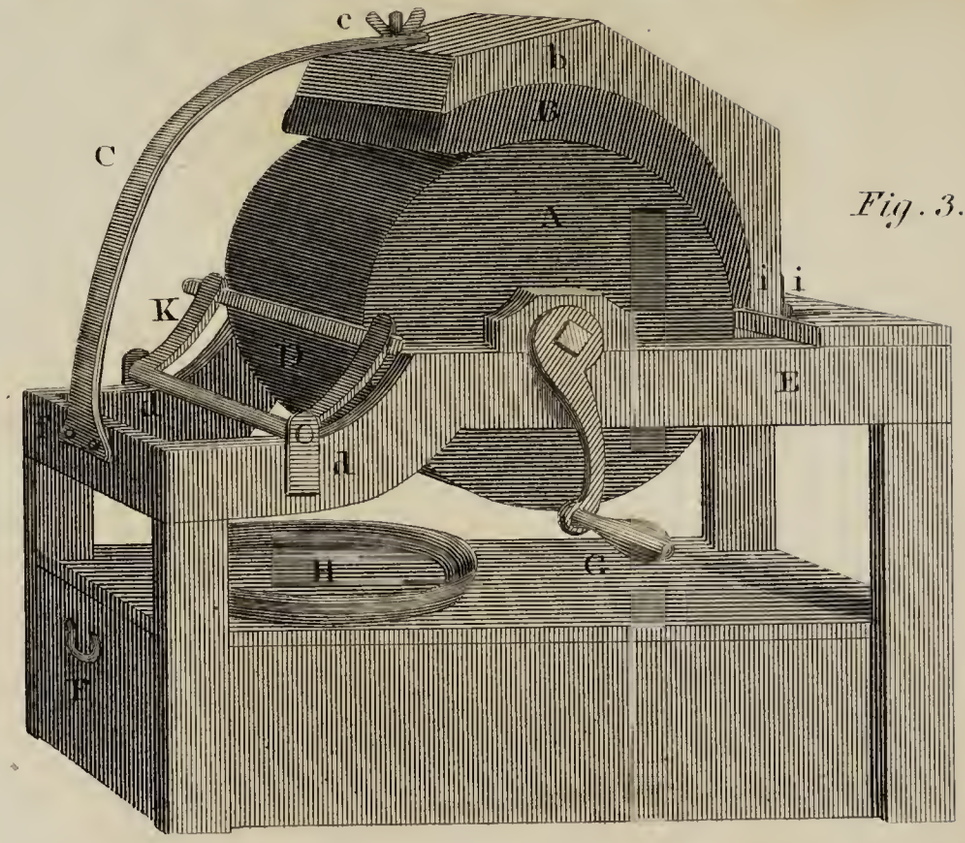


Fig. 3.

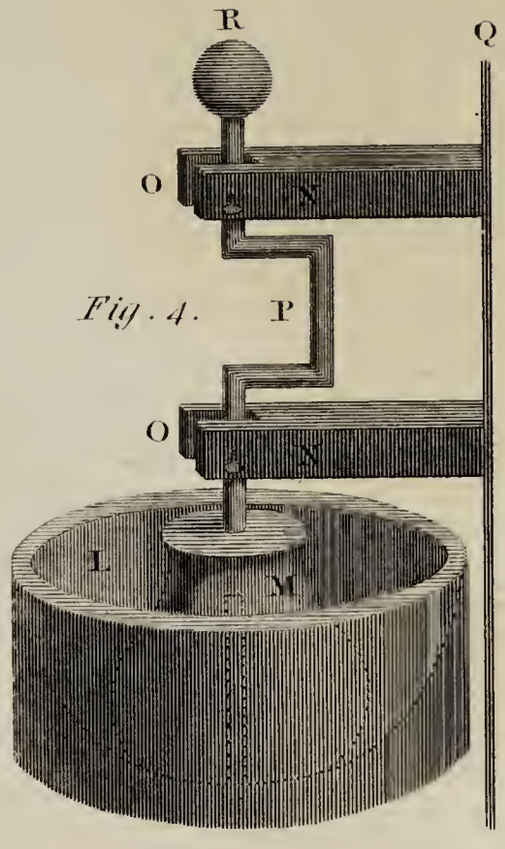


Fig. 4.

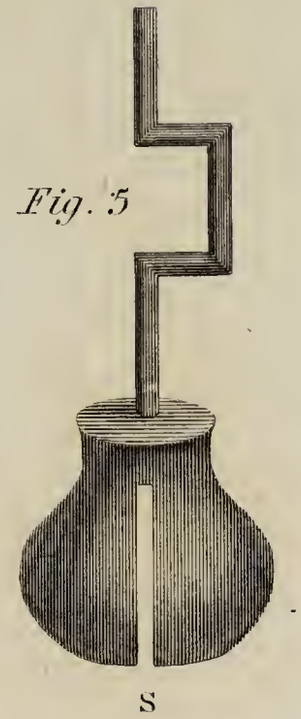


Fig. 5

Improved Indigo Mill.

C.Turley del.

S.Porter sculp.

the practicability of preserving iron from corrosion in any situation, and also how light and strong beams of cast iron may be easily constructed for other purposes.

My plan for building cones, piers, moles, or break-waters, would be of the greatest use in Plymouth Sound, Cawsand Bay, and Torbay, and in two places on the Scotch coast. The model will show the practicability, and with what dispatch a bason or harbour might be formed in ten or twelve fathom water, in any situation where the bottom is not a quicksand. I have made several other useful discoveries; what they have cost me, I am ashamed to mention. The intention of the Society is to be of service to this country, and mine has ever been the same.

I have the honour to be, Sir,

Your obedient Servant,

Leith, October 20. JOS. BRODIE.

MR. CHAS. TAYLOR.

Reference

Reference to the Engraving of Captain BRODIE'S *method of connecting Bars of Cast Iron, and coating them with lead. Plate* 6, *Fig* 1, 2.

Fig. 1. A, Shows four rods of cast iron, composed of a number of pieces two feet long, rivetted together, in a manner explained by the plate, so as to produce the effect of one bar of the thickness of the whole.

B. A tube of cast iron, formed from a number of separate pieces, each about ten inches long, and which, when placed round the iron rods above mentioned, and then screwed together, form a mould, into which the melted lead is to be poured, to coat the iron rods.

C. A portion of the rods covered with the melted lead, so as to form a cylindrical pillar apparently of lead, the iron being perfectly coated therewith.

Fig. 2.

Fig. 2. D, Shows the manner in which the hollow cylinder is formed to any length required, by the junction of a number of semi-cylinders rivetted together and fitting each other.

E. The side flanges screwed close together.

F. The end flanges also screwed together, as prepared for the melted lead.

After a certain portion of the iron rods are coated with lead, the lower parts of the tube are taken off and placed higher up; by which repeated changes, a few tubes will answer the purpose to coat any length of the iron rods.

The

The Silver Medal of the Society, and Ten Guineas, were this Session voted to Mr. James Rawlinson, of Derby, for an improved Mill for grinding Painters' Colours.

The following Account was received from him: a Plate and Description are hereunto annexed, and a Model of the Mill is placed in the Society's Repository.

SIR,

I HAVE herewith sent a Model of a Machine for grinding Paint, hoping that the Society for the Encouragement of Arts, &c. may not think their time entirely lost in examining if it has any merit; and if they should be of opinion that it has sufficient merit to recommend it to the Public, it cannot fail of receiving that attention, from the sanction of their approbation, which my recom-

recommendation could not procure for it.

The hitherto very unmechanical, inconvenient, and highly injurious method of grinding poisonous and noxious colours, led me first to imagine a better might easily be contrived for that purpose. It must be obvious to every person, that the method hitherto adopted of grinding colours on an horizontal marble slab, with a small pebble muller, requires the body of the person who grinds to bend over that slab, and consequently his head; which causes him constantly to inhale the noxious and poisonous volatile parts of the paint, which is not unfrequently ground with oil saturated with litharge of lead; and if we may judge from the very unhealthy appearance of these men, accustomed to much colour-grinding, it should seem the bad effects of this employment require a speedy remedy.

The Machine, of which I now send the Society a Model, has not only the advantage of being an effectual remedy of this extensive and severe evil to recommend it, but it grinds the colour much easier, much finer, and much quicker, than any method hitherto adopted. Having occasion for a considerable quantity of colour-grinding in the profession in which I am engaged, and that in the finest state possible, and having made use of this machine for several years, and being more and more convinced of its utility, I thought it my duty to present it to the Society of Arts, hoping that it might not be altogether unworthy of their attention. The roller of the machine that I use is sixteen inches and a half in diameter, and four inches and a half in breadth. The concave muller that it works against covers one-third of that roller: it is therefore evident, that with this machine I have seventy-

two

two square inches of the concave marble muller in constant work on the paint, and that I can bring the paint much oftener under this muller in a given space of time, than I could by the usual method with the pebble muller, which is seldom more than four inches in diameter, and consequently has scarcely sixteen square inches at work on the paint, when my concave muller has seventy-two. I do not mean to say that a roller, the size of that which I now use, is the largest which might be employed; for truly I believe that a roller two feet in diameter, with a concave muller in proportion, would not be hard work for a man; and then the advantage to the public would be still farther increased.

This machine will be found equally useful for the colours ground in water, as for those ground in oils; and I doubt not but the great importance of this simple machine will be very

soon generally experienced in all manufactories where colours are used. The labour necessary with this machine, in grinding colours exceedingly fine, is very easy. It is useless to enter into any minute description in this place, as a bare inspection of the machine must sufficiently explain itself.

To the colourman it would evidently be an essential saving of labour, and consequently of expense, which will probably have some weight as a recommendation; and the advantages to the colour-grinder have been already stated.

I am, Sir,

Your very obedient servant,

JAMES RAWLINSON.

Derby, Jan. 10, 1804.

CHARLES TAYLOR, Esq.

SIR,

SIR,

I WAS duly favoured with your letter of the 3d instant; and in reply to the questions that the Committee have proposed, I have made a rough sketch of the Machine, with letters of reference, as supposing this may better explain the process. Plate 6, Fig. 3, A is the roller or cylinder made of any kind of marble; black marble is esteemed the best, because it is the hardest, and takes the best polish. B is the concave muller covering one-third of the roller, and of the same kind of marble, and is fixed in a wooden frame *b*, which is hung to the frame E at *i i*. C is a piece of iron, about an inch broad, to keep the muller steady, and is fixed to the frame with a joint at *f*. The small binding-screw, with the fly nut, that passes through the centre of the iron plate at *c*, is for the purpose of laying more

pressure on the muller, if required, as well as to keep it steady. D is a taker-off, made of a clock-spring about half an inch broad, and fixed similar to a frame-saw in an iron frame *k*, in an inclined position to the roller, and turning on pivots at *d d*. G is a slide-board to draw out occasionally, to clean, &c. if any particles of paint should fall from the roller, and which also forms itself for the plate H, to catch the colour on as it falls from the taker-off. F is a drawer, for the purpose of containing curriers shavings, which are the best things for cleaning paint-mills.—E is the frame.

Previous to the colour being applied to the mill, I should recommend it to be finely pulverized in a mortar, covered in the manner of the chemists when they levigate poisonous drugs.* This process

* Or rather in an improved mill, used at Manchester by Mr. Charles Taylor, for grinding indigo in

process of dry-grinding is equally necessary for the marble slab now in use; after which it should be mixed with oil or water, and with a spatula or pallet-knife put on the roller, near to the top of the concave muller, and the roller turned round, which takes the colour under the muller without any difficulty, and very few turns of the roller spread it equally over its surface. When it is perceived sufficiently fine for the purpose required, it is very easily taken off by means of the taker-off described, which must be held against the roller, and the roller turned the reverse way, which cleans it very quick and very completely; and the muller will only require to be cleaned when you desist or change the colour. It is then turned back, being hung on pinions to the frame at *i i*, and cleaned with a pallet-

in a dry state, of which I have annexed a drawing, and reference, to render the whole business of colour-grinding complete.

knife or spatula very conveniently.—Afterwards, a handful of curriers shavings held on the roller, with two or three revolutions, cleans it effectually; and there is less waste with this Machine than with any marble slab.

As to the quantity ground at once on this mill, it must be regulated by the state of fineness to which it is required to be ground. If it is wanted to be very fine, a smaller quantity must be put on the roller at a time; and as to time requisite for grinding a given quantity of colour, this will also depend on the state of fineness to which it is ground. I have observed that my colour-grinder has ground the quantity of colour which used to serve him per day, with this machine, in three hours, and, as he said, with ease. The colour also was much more to my satisfaction than in the former way, and attended with less waste.

I have mentioned the pulverizing the colours in a covered mortar, which would

would prevent waste, and prevent the dust and finest parts of noxious colours from being injurious to the grinder.—In some manufactories, where large quantities of colours, prepared from lead, copper, and arsenic, are used, this precaution is particularly necessary. I do not mean to say that my machine is intended to supersede the paint-mill now in use for coarse common colours. It is intended for no such purpose; but to supersede the use of the very awkward and unmechanical marble slab now in use, and on which all the colours for china manufactories, coach-painters, japanners, and colour-manufacturers for artists, &c. &c. are now ground.

Several of the colour-manufacturers have expressed to me their great want of such a machine; and that I had no desire of troubling the public with a machine that would not answer, is evident, from my having used it several

years

years before I presumed to recommend it to their attention. Being therefore now completely convinced of its utility, and hoping that it might relieve a number of my fellow-creatures from a dangerous employment, I have ventured to commit it to the protection of the Society of Arts; hoping, through their means, to see its ultimate success. And, farther to give the Society the most complete assurance in my power, I have annexed the opinion of a very ingenious and mechanical friend of mine, who has frequently seen it work. If any other questions should occur to the Committee, that may be in my power to explain, I shall gladly do so.

I am, Sir,

Your most obedient servant,

JAMES RAWLINSON.

Derby, Feb. 6, 1804.

CHARLES TAYLOR, Esq.

P. S. When the colour is ground, I recommend the following mode of tying

tying it up in bladders, in preference to the usual method. Instead of drawing the neck of the bladder close, in the act of tying it, insert a slender cylindrical stick, and bind the bladder close around it. This, when dry, will form a tube or pipe, through which, when the stick is withdrawn, the colour may be squeezed as wanted, and the neck again closed by replacing the stick. This is not only a neater and much more cleanly mode than the usual one of perforating the bladder; and stopping the hole with a nail, or more commonly leaving it open, to the prejudice of the colour; but the bladder, being uninjured, may be used repeatedly for fresh quantities of colour.

N.B. The barrel of a quill may be tied, in place of the stick, into the neck of the bladder, with its closed end outwards, which will keep the colour secure in travelling, and when used, the

end

end of the quill being cut off, it may afterwards be closed by a stick.

A Certificate from Mr. Thomas Swanwick, of Derby, and also from Mr. John Middleton, of St. Martin's-lane, confirming the above statement, accompanied these papers.

Reference to the improved Mill, for grinding Indigo, or other dry colours,

Plate 6. *Fig.* 4. L, represents a mortar made of marble or hard stone; one made in the common way will answer.

M, A muller or grinder, nearly in the form of a pear, in the upper part of which an iron axis is firmly fixed, which axis, at the parts NN, turns in grooves or slits, cut in two pieces of oak projecting horizontally from a wall, and when the axis is at work, are

are secured in the grooves by iron pins, O O.

P. The handle, which forms a part of the axis, and by which the grinder is worked.

Q. The wall in which the oak pieces, N N, are fixed.

R. A weight, which may occasionally be added, if more power is wanted.

Fig. 5, Shows the muller or grinder, with its axis separate from the other machinery; its bottom should be made to fit the mortar.

S. Is a groove cut through the stone.

On grinding indigo, or such substance, in a dry state, in this mill, the muller being placed in the mortar, and secured in the oak pieces by the pins, the indigo to be ground is thrown above the muller into the mortar; on turning the handle of the axis, the indigo in lumps falls into the groove cut through the muller, and is from thence drawn under

under the action of the muller, and propelled to its outer edge within the mortar, from whence the coarser particles again fall into the groove of the muller, and are again ground under it; which operation is continued, till the whole of it is ground to an impalpable powder; the muller is then easily removed, and the colour taken out.

A wood cover, in two halves, with a hole for the axis, is usually placed upon the mortar, during the operation, to prevent any loss to the colour, or bad effect to the operator.

The

The GOLD MEDAL of the Society was this Session voted to Mr. ROBERT SEPPINGS, of Chatham Yard, for his method of obviating the necessity of lifting ships.

An Engraving of this Invention is hereunto annexed, and of its application for the purpose of fids for masts.

Models and Drawings, explanatory of the manner in which the different operations are effected, are placed in the Society's Repository.

The following COMMUNICATION was received from him.

SIR,

I HAVE to request you will lay before the Society a Drawing and Model, with a Paper, descriptive of a plan, invented by me, for obviating the necessity of lifting ships; the same having been proved and put in practice

tice in his Majesty's dock-yards; should the Society think it deserving their notice.

I am, Sir,
Your most obedient servant,
ROBT. SEPPINGS.

London, Nov. 23, 1803.

CHARLES TAYLOR, Esq.

THE following is a description of an invention, by Mr. Robert Seppings, late master shipwright assistant in his Majesty's yard at Plymouth, (now master shipwright of his Majesty's yard at Chatham), for suspending, instead of lifting, ships, for the purpose of clearing them from their blocks; by which a very great saving will accrue to the public; and also two-thirds of the time formerly used in this operation. From the saving of time another very important advantage will be derived, that of enabling

enabling large ships to be docked, suspended, and undocked, the same spring tides. Without enumerating the inconveniencies arising, and, perhaps, injuries, which ships are liable to sustain, from the former practice of lifting them, and which are removed by the present plan; that which relates to manual labour deserves particular attention; twenty men being sufficient to suspend a first-rate, whereas it would require upwards of 500 to lift her. The situation which Mr. Seppings held in Plymouth yard, attached to him, in a great degree, the shoring and lifting of ships, as well as the other practical part of the profession of a shipwright. Here he had an opportunity of observing, and indeed it was a subject of general regret, how much time, expense, and labour, were required in lifting a ship, particularly ships of the line. This induced him to consider whether some contrivance could not be adopted

to obviate these evils. And it occurred to him, that if he could so construct the blocks on which the ship rests, that the weight of the ship might be applied to assist in the operation, he should accomplish this very desirable end. In September, 1800, the shoring and lifting the San Josef, a large Spanish first-rate, then in dock at Plymouth, was committed to his directions; to perform which, the assistance of the principal part of the artificers of the yard was requisite. In conducting this business, the plan, which will be hereafter described, occurred to his mind; and from that time, he, by various experiments, proved his theory to be correct: the blocks, constructed by him, upon which the ship rests, being so contrived, that the facility in removing them, is proportionate to the quantity of pressure; and this circumstance is always absolutely under command, by increasing or diminishing the angle of three wedges,

wedges, which constitute one of the blocks; two of which are horizontal, and one vertical. By enlarging the angle of the horizontal wedges, the vertical wedge becomes of consequence more acute; and its power is so increased, that it has a greater tendency to displace the horizontal wedges, as can be proved by a model, which accompanies this statement; where the power of the screw is used as a substitute for the pressure of the ship.

Mr. Seppings caused three blocks to be made of hard wood, agreeable to his invention, and the wedges of various angles. The horizontal wedges of the first block were nine degrees; of the second, seven; and of the third, five; of course, the angle of the vertical wedge of the first block was 162 degrees; of the second, 166; and of the third, 170. These blocks, *or* wedges, were well executed, and rubbed over with soft soap for the purpose of expe-

riment. They were then placed in a dock, in his Majesty's yard at Plymouth, in which a sloop of war was to be docked; on examining them after the vessel was in, and the water gone, they were all found to have kept their situations, as placed before the ship rested upon them. Shores in their wake were then erected to sustain the ship, prior to the said blocks being taken from under the keel. The process of clearing them was, by applying the power of battering-rams to the sides of the outer ends of the horizontal wedges; alternate blows being given fore and aft; by which means they immediately receded, and the vertical wedges were disengaged. It was observed, even in this small ship, that the block which was formed of horizontal wedges of nine degrees, came away much easier than those of seven, and the one of seven, than that of five. In removing the aforesaid blocks by the power of the battering-

battering-rams, which were suspended in the hands of the men employed, by their holding ropes passed through holes for that purpose, it was remarked by Mr. Seppings, that the operation was very laborious to the people; they having to support the weight of the battering-rams, as well as to set them in motion. He then conceived an idea of affixing wheels near the extremity of that part of the rams, which strikes the wedges. This was done before the blocks were again placed; and it has since been found fully to answer the purpose intended, particularly in returning the horizontal wedges to their original situations, when the work is performed for which they were displaced; the wheels also giving a great increase of power to the rams, and decrease of labour to the artificers; besides which, the blows are given with much more exactness. The same blocks were again laid in another dock, in which a two-decked ship of the line was docked.

On examination, they were found to be very severely pressed, but were removed with great ease. They were again placed in another dock, in which a three-decked ship of the line was docked. This ship having in her foremast and bowsprit, the blocks were put quite forward, that being the part which presses them with the greatest force. As soon as the water was out of the dock, it was observed, that the horizontal wedges of nine and seven degrees had receded some feet from their original situations. This afforded Mr. Seppings a satisfactory proof, which experience has since demonstrated, (though many persons before would not admit of, and others could not understand, the principle) that the facility of removing the blocks or wedges, was proportionate to the quantity of pressure upon them. The block of five degrees kept its place, but was immediately cleared, by applying the power

of

of the battering-rams to the sides of the outer ends of the horizontal wedges. The above experiments being communicated to the Navy Board, Mr. Seppings was directed to attend them, and explain the principle of his invention; which explanation, farther corroborated by the testimonials of his then superior officers, was so satisfactory, that a dock was ordered to be fitted at Plymouth under his immediate directions. The horizontal wedges in this, and in the other docks, that were afterwards fitted by him, are of cast iron, with an angle of about five degrees and a half, which, from repeated trials, are found equal to any pressure, having in no instance receded, and, when required, were easily removed. The vertical wedge is of wood, lined with a plate of wrought iron, half an inch thick. On the bottom of the dock, in the wake of each block, is a plate of iron three quarters

of an inch thick, so that iron at all times acts in contact with iron.

The placing the sustaining shores, the form and sizes of the wedges, and battering-rams, &c. also the process of taking away, and again re-placing, the wedges of which the block is composed, are also exemplified by a model.

The dock being prepared at Plymouth, in August, 1801, the Canopus, a large French 80-gun ship, was taken in, and rested upon the blocks; and the complete success of the experiment was such, that other docks were ordered to be fitted at Sheerness and Portsmouth Dock-yards, under Mr. Seppings's directions. At the former place a frigate, and at the latter a three-decked ship, were suspended in like manner. This happened in December, 1802, and January, 1803; and the reports were so favourable, as to cause directions to be given

given for the general adoption of these blocks in his Majesty's yards. This invention being thought of national consequence, with respect to ships, but particularly those of the navy, Government has been pleased to notice and reward Mr. Seppings for it.

The time required to disengage each block, is from one to three minutes after the shores are placed: and a first-rate sits on about fifty blocks. Various are the causes for which a ship may be required to be cleared from her blocks, viz. to shift the main keel; to add additional false keel; to repair defects; to caulk the garboard seams, scarples of the keel, &c. Imperfections in the false keel, which are so very injurious to the cables, can in the largest ship be remedied in a few hours by this invention, without adding an additional shore, by taking away blocks forward, amidships, and abaft, at the same time; and when the keel is repaired in the

wake

wake of those blocks, by returning them into their places, and then by taking out the next, and so on in succession. The blocks can be replaced in their original situations, by the application of the wheel battering-rams to the wedges, the power of which is so very great, that the weight of the ship can be taken from the shores that were placed to sustain her. There were one hundred and six ships of different classes, lifted at Plymouth dock-yard, from the 1st of January, 1798, to the 31st of December, 1800; and, had the operation of lifting taken less time, the number would have been very considerably increased; for the saving of a day is very frequently the cause of saving the spring tide, which makes the difference of a fortnight. The importance of this expedition, in time of war, cannot be sufficiently estimated.

This invention may be applied with great advantage, whenever it is neces-

sary

sary to erect shores, to support any great weights, as, for instance, to prop up a building during the repair of its foundation, &c. Captain Wells, of his Majesty's ship Glory, of 98 guns, used wedges of Mr. Seppings's invention for a fid of a top-gallant mast of that ship. In 1803, the top-gallant masts of the Defence, of 74 guns, were fitted on this principle by Mr. Seppings; and, from repeated trials, since she has been cruizing in the North Sea, the wedge fids have been found in every respect to answer.

But it is Mr. Seppings's wish that it should be understood, that the idea of applying his invention to the fid of a top-gallant mast originated with Capt. Wells, who well understood the principle, and had received from him a model of the invention.

When it is required to strike a top-gallant mast, the top ropes are hove tight, and the pin which keeps the horizontal

horizontal wedges in their place, is taken out, by one man going aloft for that purpose; the other horizontal wedge is worked in the fid, as shown in the drawing and model that accompany this statement. The upper part of the fid hole is cut to form the vertical wedge. The advantage derived from fidding top-gallant masts in this way is, that they can be struck at the shortest notice, and without slacking the rigging, which is frequently the cause of springing and carrying them away, particularly those with long pole heads. The angle of the horizontal wedges for the fids of masts should be about twenty degrees.

The above Account was accompanied with Certificates from Sir John Henslow, Surveyor of the Navy; Mr. M. Didram, master-shipwright of Portsmouth-Yard; and Mr. John Carpenter, Foreman

Mr. Sepping's Method of suspending Ships.

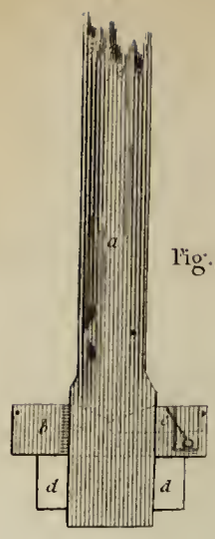


Fig. 3.

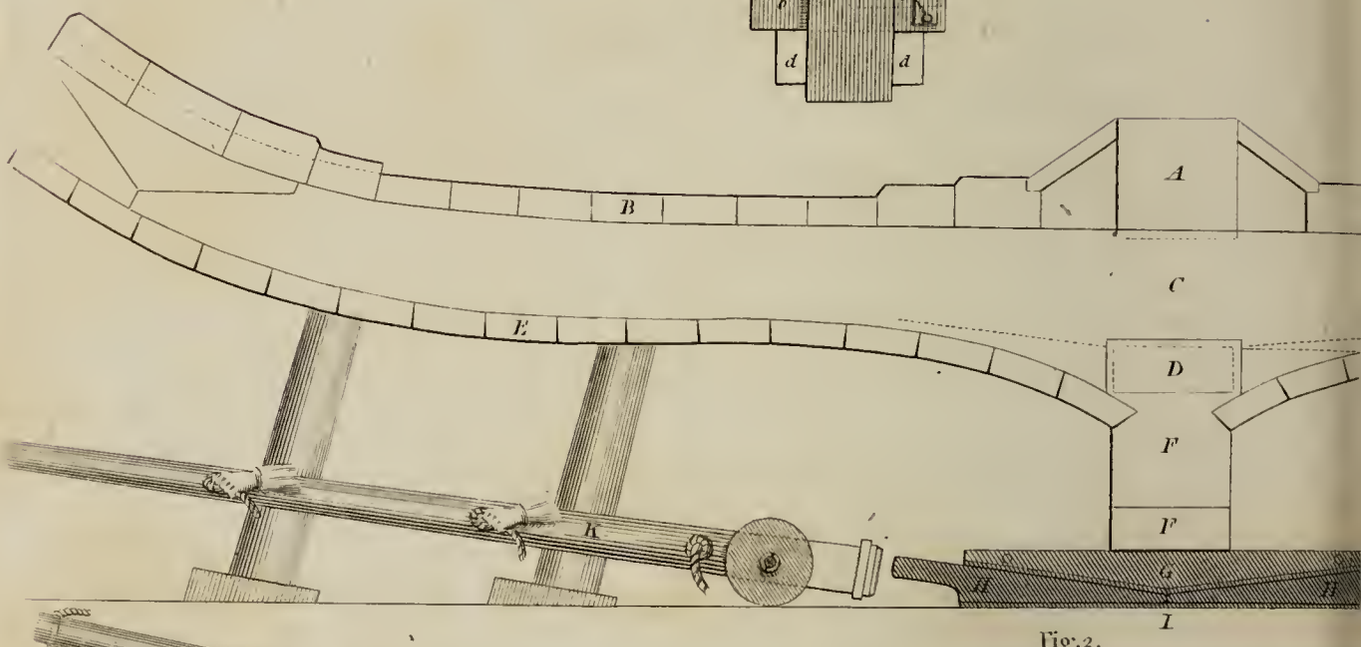


Fig. 2.

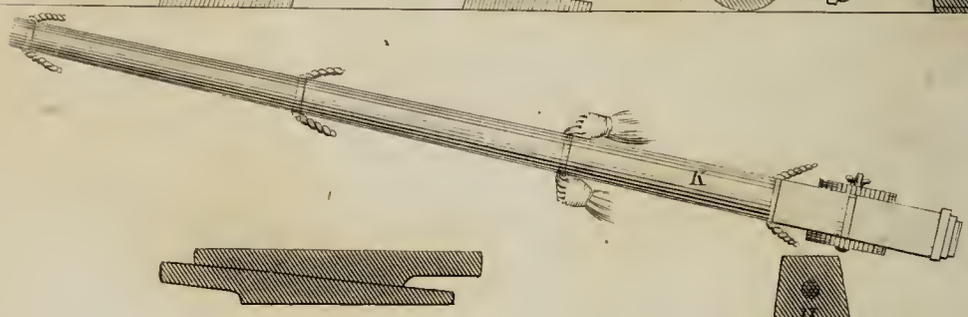
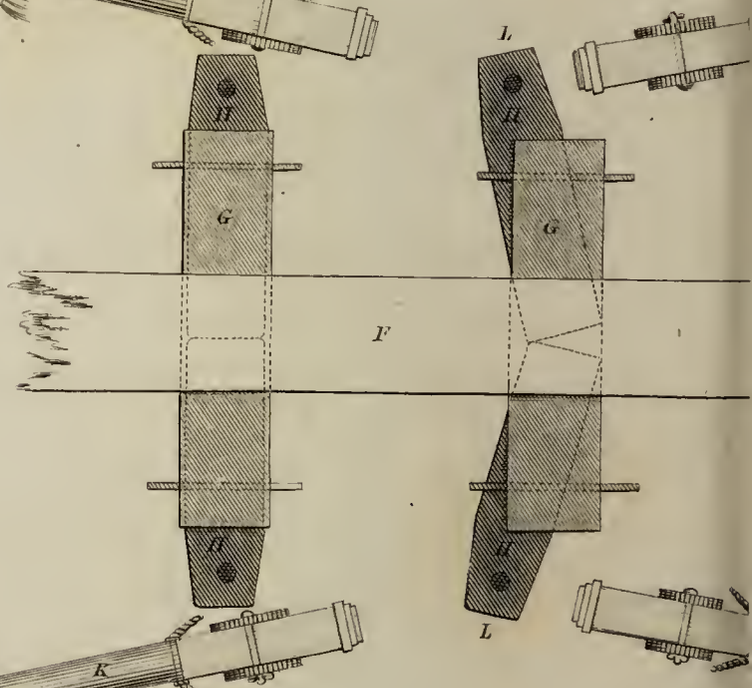
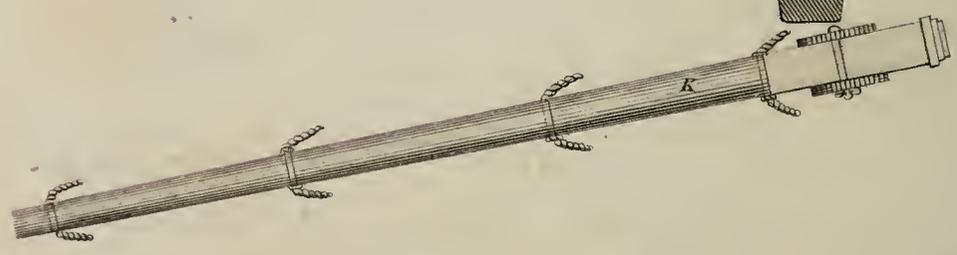
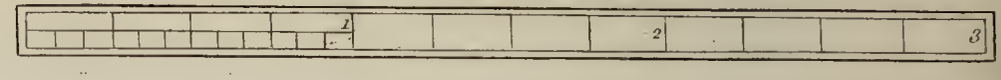


Fig. 1.





Scale ¼ of an Inch to a Foot.



C. Varley delin.

Foreman of Sheerness Dock-yard, confirming Mr. Seppings's statement.

Reference to the Engraving of Mr. SEPPINGS's *method of obviating the necessity of lifting Ships. Plate VII.*

This plan and section of a seventy-four gun ship describes the method of obviating the necessity of lifting ships, when there may be occasion to put additional false keels to them, or to make good the imperfections of those already on; also when it may be necessary to caulk the garboard seams, scarples of the keel, &c. by which means a very considerable part of the expense will be saved, and much time gained. The blocks are cleared, and again returned by the following process. A sufficient number of shores are placed under the ship to sustain her weight, and set taught, stationed as near the keel as the working of the battering-rams fore and

and aft will admit. Avoid placing any opposite the blocks, as they would in that case hinder the return of the wedges with the battering-rams. A blow must then be given forward on the outer end of the iron wedges with the battering-rams in a fore and aft direction, which will cause them to slide aft, as shown in the plan. The battering-rams abaft then return the blow, and the wedges again come forward; by the repetition of this operation, the wedges will be with great ease cleared, and the angular block on the top will drop down. When the work is performed, the block must be replaced under the keel, and the wedges driven back by working the rams athwart-ships, as described in the section.

N.B. In returning the iron wedges, to avoid straining the angular blocks, it is proposed to leave a few of them out forward and aft, and stop the ship up,

up, by laying one iron wedge on the other, as shown at *Fig.* 1, *Plate VII.*

To facilitate the business, blocks may be cleared forward and aft at the same time, sufficient to get in place one length of false keel. If the false keel should want repairing, it may be done without any additional shores, by clearing one block at a time, and when the keel is repaired in the wake of that block, return the wedges, as above directed, and clear the next, &c.

Section and Plan, Plate VII. Fig. 2.

A. Keelson.
B. Ceiling.
C. Floor timber.
D. Dead or rising wood.
E. Plank of the bottom.
F. Keel and false keel.
G. Angular blocks with a half-inch iron-plate bolted to them.

H. Cast

H. Cast-iron wedges.

I. Iron plate of three-fourths of an inch thick on the bottom of the dock.

K. Battering-rams, with wheels, and ropes for the hands.

L. Cast-iron wedges, having received a blow from forward.

M. Shores under the ship to sustain her weight.

Fig. 3, represents part of a top-gallant mast fitted with a wedge fid.

a. Top-gallant mast.

b. Fid, with one horizontal wedge worked on it.

c. Moveable wedge, with the iron strap and pin over it, to keep it in its situation.

d. Trussel trees.

The SILVER MEDAL of the Society, and TEN GUINEAS, were this Session voted to Mr. GEORGE DODD, of Duke-street, Portland-place, for an improved GUN-LOCK.

An ENGRAVING of this Invention is hereunto annexed; and a MODEL thereof is placed in the Society's Repository for public inspection.

The following COMMUNICATION was received from him.

SIR,

PERMIT me to request you to lay before the Society of Arts, the accompanying *Improved Gun-Lock*, as I am anxious to unite the opinion of so respectable a Society to the high military approbation it has been honoured with; that improvements so very useful to our country, may have that publicity which they deserve.

The invention is original, and the principles are new, and totally dissimilar to any others ever made public. In these improvements, I am persuaded, you will observe with pleasure a happy union of *strength*, *simplicity*, and *cheapness*, blending at the same time a variety of other most important improvements, well calculated to prevent injurious accidents to our friends, and to be more effectual against our foes.

I would just farther observe, that I have caused these locks to be fitted to muskets, and practised by some Volunteer Corps, where the result fully equalled my wishes. Immediately after I had perfected these improvements, I communicated them to the proper military officers, that no time might be lost at this critical juncture of national affairs, in rendering them of service to the country. They were therefore inspected and approved of by his Royal Highness the Commander in Chief, who

has

has publicly declared his opinion of their superior utility. They have also been inspected by Generals Drummond, Lloyd, Fead, Blomefield, and others, at Woolwich, who in their reports to the Honourable Board of Ordnance, entirely approve of the improved Locks, some of which are now manufacturing by order of the Honourable Board. I wish, therefore, without delay, to render them public, as they are equally applicable to civil as well as military purposes. Any improvements in fire-arms are truly essential to the country, not only from its present military posture, but the great quantity daily manufactured; Government alone having annually had 150,000 small arms, on a mean of the last ten years, as I am informed by his Majesty's principal Armoury Officer at the Tower.

Nothing farther appears necessary to render these useful improvements public, than to unite to this military ap-

probation, the opinion of the Society of Arts; and I trust that these improvements will appear to merit their approbation, when they have been duly considered, and will find a place in their excellent Repository.

I am, Sir,

Your most obedient servant,

G. Dodd.

London, Jan. 30, 1804.

Chas. Taylor, Esq.

Description of Mr. Dodd's *improved Gun-Lock.*

This Lock is so perfectly secure at half-cock, as to preclude the possibility of its firing in that state, by *accident*, *violence*, or *design*. It possesses all the *advantages* of stop, or *bolt-locks*, without their inconveniences or complicated construction. Nor has it one piece of machinery more than there is at present in the simplest of common locks.

Though

Mr. Dodd's Gun Lock.

Fig. 3.

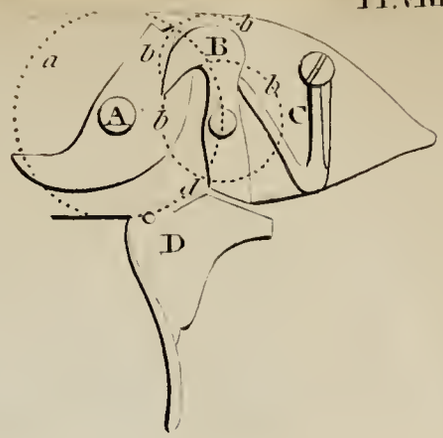


Fig. 1.

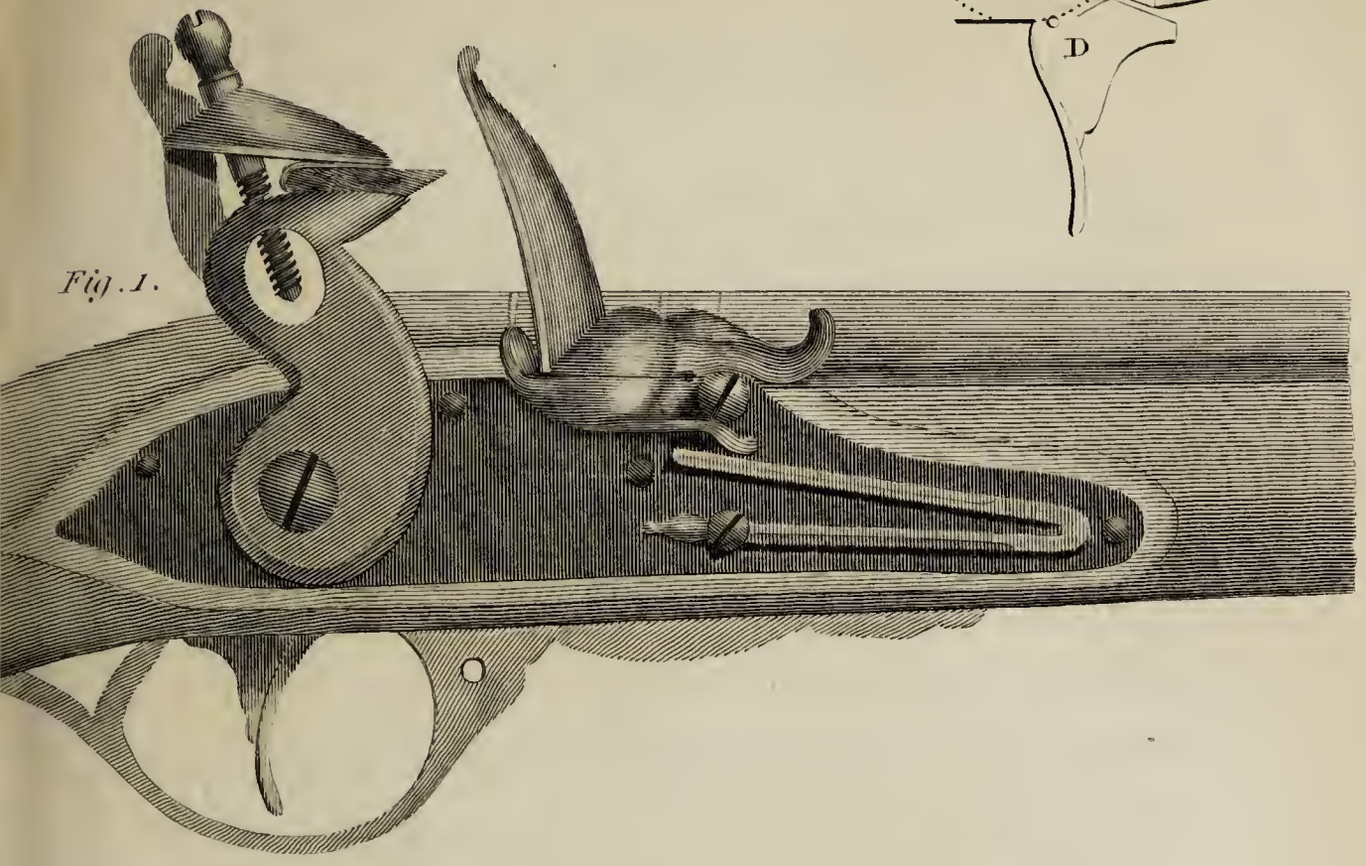


Fig. 4.

Fig. 2.

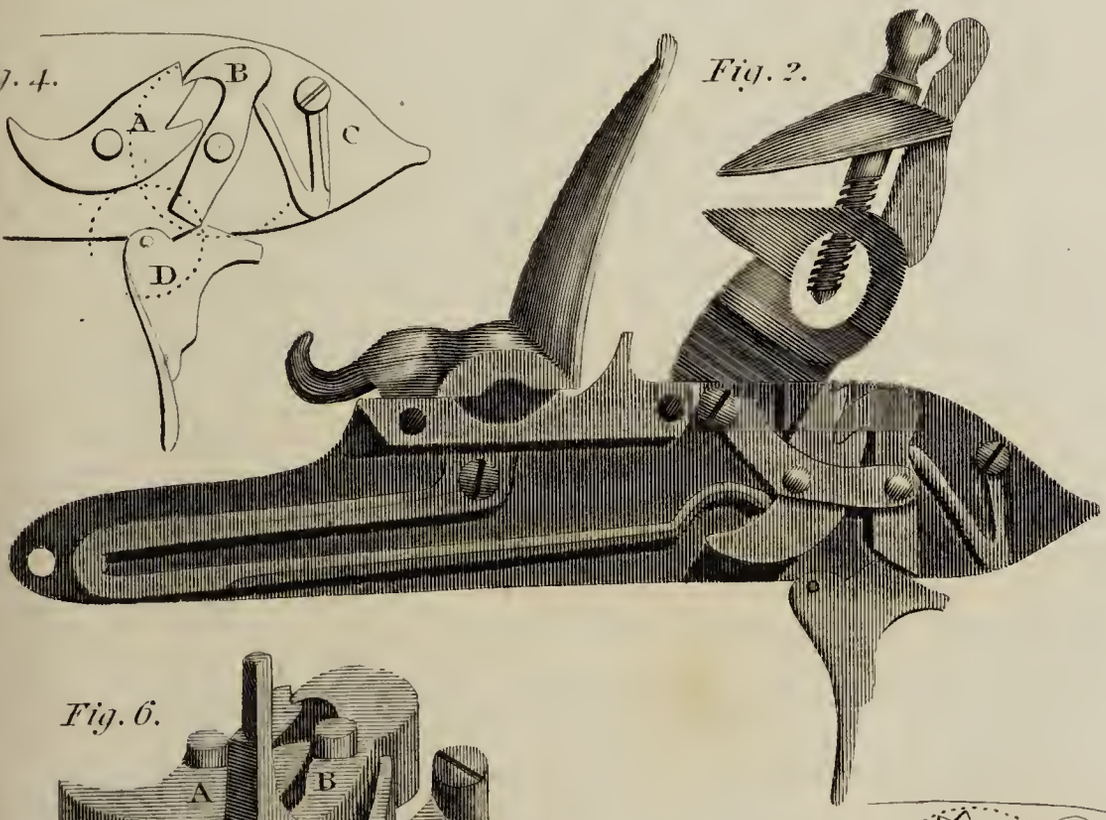


Fig. 6.

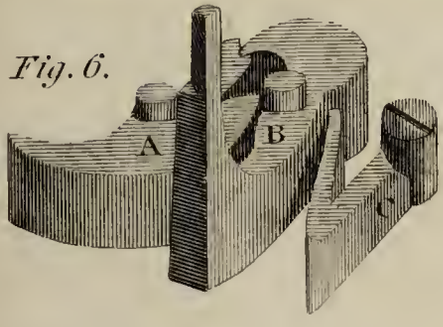
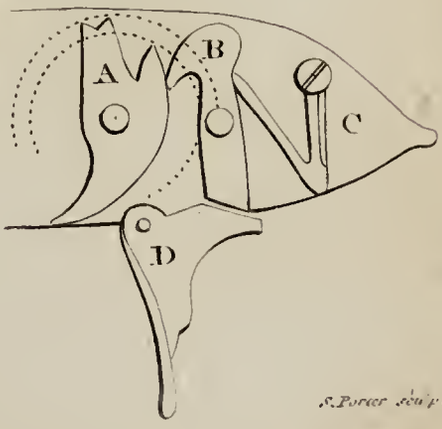


Fig. 5.



Geo. Dodd del.

S. Porter Sculp.

Though these improved locks are perfectly secure at half-cock, they will fire from whole-cock, with much more certainty than a lock having a hair-trigger, because less complex, and with equal fleetness.

A most valuable improvement in this lock is, that *pulling the trigger*, when the piece is at *half-cock*, renders it *more and more secure*, the reverse of this being the case with common locks; for the more powerfully the trigger is pulled when they are at half-cock, the more insecure they become.

Another truly essential improvement is, that this lock *cannot possibly* catch and *stop*, at the position of *half-cock*, when *passing from the whole cock*, and *miss fire;* a serious misfortune, to which locks made on the common principle are so liable, that to prevent it, all the best of these use a peculiar piece of machinery called a fly, or *détachant*.

The improved locks will be much *less liable* to be *out of repair*, as the bents are much deeper, and run through the solid metal direct towards the centre of the tumbler; unlike the usual bents, that are *small*, *pointed*, and the line of their depth *near the circumference* of the tumbler. Hence they are apt to be snapped off, or easily worn away, and fire from half-cock, as too frequently and fatally occurs.

When these improved locks require cleaning, they are of so plain and simple a construction, as easily to be taken to pieces, and put together by any soldier or sportsman.

To put one of these improved locks to an *old stock*, it is merely necessary to make some *trivial alterations* in the excavation of the wood.

The sportsman who has one of these improved locks to a fowling-piece, if the trigger should become entangled with

with a twig, may forcibly *pull his piece away*, assured, that in so doing, he increases his safety; but, if it be a common lock, he must turn back, and cautiously unloose, lest the piece explode.

The improved locks possess four times the strength of common locks where the latter are weakest, and are of equal strength in all other parts.

Among the many contrivances and complicated means to prevent pieces going off at half-cock, *bolts* have principally been used; but they are ill adapted to the purpose, exclusive of the additional expense; for few people, when *alarmed*, have the *presence of mind* first to unbolt the piece to render it fit for service, but they instantly attempt to cock. Disappointment adds to their agitation, and increases the confusion; and, ere they recollect their mistake, the lost moments, at such a juncture, may occasion the loss of their lives; especi-

ally from free-booters and riflemen, who are always prepared before they attack, and seldom show mercy to them from whom it appeared they had none to expect. But this lock is admirably devised for *safety and service*, as it merely need be *cocked* for *use*, and *half-cocked* for *security;* both which can be performed with expedition equal to that of any other lock that ever was made public.

Common locks are subject to the most momentous failing of a *false* or *delusive half-cock;* for the nose of the sear rests on the point of the half-cock bent, which, as it causes no *alteration* in the external *appearance*, cannot be discovered, and its sad effects prevented. This very serious accident frequently occurs among recruits and unskilful gunners, from inattention to a very fine punctilio of military exercise; but it is utterly impossible that this should ever occur with the improved Lock, by *accident*

cident or *even by design*. The improved lock is constructed on more mechanical principles, and is much simpler, and more easy to manufacture, than any other lock. Hence, there will be *no increase of expense* in execution, but a considerable decrease to the locks of *rifles*, *fowling-pieces*, *pistols*, &c.

Simplicity alone is deemed a valuable improvement; but, to this excellency, the improved lock unites a pleasing variety of *new* and *useful* superiorities, *without sacrificing any advantage* which the best of common locks at present possess.

These improvements are equally applicable to all descriptions of fire-arms, civil as well as military.

Certificates of the utility and novelty of Mr. Dodd's Gun-Locks were received from the following gun-makers; viz.—Mr. Philip Bond, of Cornhill; Mr. W. Clark, of Holborn; and Messrs. Tatham and Egg, Admiralty. Two letters from the

the Board of Ordnance to Mr. Dodd, approving of his invention, were also submitted to the Society.

Explanation of the Engraving of Mr. DODD'S *improved Gun-Lock, Plate VIII.*

Fig. 1. Represents the exterior of the improved Gun-Lock.

Fig. 2. The interior of the same.

Fig. 3. Shows, A, the tumbler; B, the sear; C, the sear spring; D, the trigger: all at the position of half-cock.

Fig. 4. Represents the same parts at whole-cock.

Fig. 5. Bearer, or the position of A, B, C, and D, immediately after the lock is fired, and the finger withdrawn from the trigger.

The particulars to be attended to in constructing this Lock are, that the centre of the sear B, should be *placed in the circle, a, Fig.* 3. (the radius of this circle

circle lies between the *centre* of the tumbler and the extreme *point of whole-cock bent*); and that *the under side of the nose of the sear* and the *under side of half-cock bent*, and the *under side of whole-cock bent*, must be *segments of the circle b*, whose radius extends from the under side of the nose of the sear to the centre of the sears; by this means the sear will fit both the the bents *perfectly close*, and hold quite firm together without *any tendency to alter their positions*; neither will they need any *assistance* from the sear spring *to keep them* in their station.

It is also necessary that the back of the sear be somewhat hollowed, to prevent the sear spring pressing too hard at whole-cock. These are the mechanical points to be attended to in making one of the improved Gun-Locks; all other particulars workmen will soon discover by inspecting the plate.

A Bounty

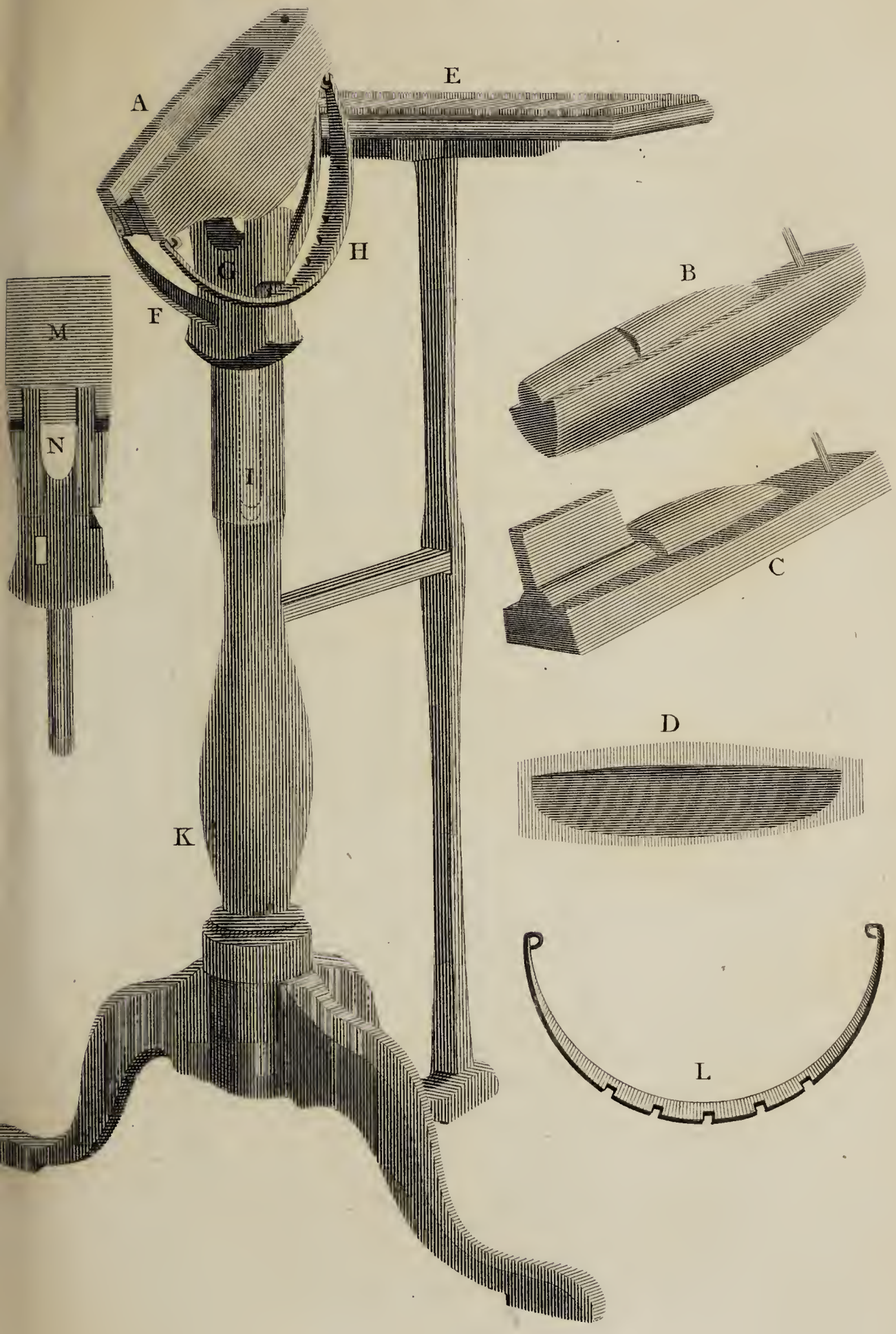
A Bounty of FIFTEEN GUINEAS was this Session voted to Mr. THOMAS HOLDEN, of Fettleworth, near Petworth, in Sussex, for his Invention of a MACHINE to do all the THREAD-WORK in SHOEMAKING in a standing Posture.

An ENGRAVING of the Machine is hereunto annexed; one of the Machines is reserved in the Society's Repository; and the following COMMUNICATION was received from him.

SIR,

THOMAS HOLDEN, of Fettleworth, near Petworth, has invented a Machine to do all the thread-work in shoemaking, standing. To persons in health, the constant sitting posture used in this business is very pernicious; occasioning piles, gravel, and other disorders.

Mr. Holden's Machine for Shoe-makers.



C. Varley del.

orders. This machine will obviate these evils; the expense of it will not be more than from twenty to thirty shillings, which being within the means of every journeyman to obtain, renders the object very desirable. I beg leave to recommend it to the Society's attention, and am, Sir,

Your very humble servant,

NICHOLAS TURNER.

Lurgasale, near Petworth,
Sept. 28, 1802.

Mr. CHAS. TAYLOR.

SIR,

FROM the sitting posture used in my employment, as a shoemaker, I suffered so much in my health, and from the piles, that I thought I must either give up my business, or lose my life. In this difficulty I invented this Machine, got it made, and went to work with it. I found it answer to my satisfaction, and its use followed by a restoration

restoration of my health. I believe I have made eighteen hundred or two thousand pair of shoes with it, and still work on. I recommend it as the quickest way of closing all the thread-work.

My Machine is fixed to the floor, a little to the left of the seat, but within reach of the hand; the work is held on with a stirrup, and suits to the place. You will see from a trial, that it will perform the work to my credit.

I am, Sir,
Your humble servant,
THOMAS HOLDEN.

Fettleworth, Jan. 24, 1803.

CHAS. TAYLOR, Esq.

CERTIFICATES from John Summersell, cordwainer, and overseer of the parish; Richard Hawkins, John Tilly, George Hawkins, Thomas Tilly, and Edward Hawkins, cordwainers, confirmed the above statement.

SIR,

SIR,

I AM sincerely of opinion, that Thomas Holden's invention is a desirable acquisition to men of that profession, especially to those who may be diseased internally, or who may suffer from stomach weakness and indigestion. These diseases may be aggravated, if not occasioned, by their working in a bent posture.

The inventor, about twenty years ago, often applied to me for relief from a train of bowel complaints, and frequently had occasion to take the medicines usually employed for the relief of dyspepsia.

I repeatedly informed him, that his employment was the cause of his disorder, and desired him to relinquish it, or invent some method to do his work standing. This hint, and his corporeal sufferings, prompted him to the invention. That it answers the purpose, I have

have reason to believe, as he and others use it. He is now free of complaints, and so improved in his corpulence and countenance, that he is not like the same man, and for years has had no occasion for medicine.

I am, Sir,
Your obedient servant,
PETER MARTIN, Surgeon.

Tulborough, Suffex, May 9, 1803.

Mr. CHARLES TAYLOR.

Reference to the Engraving of Mr. HOLDEN'S *Invention for Shoemakers, Pl. IX.*

A. The bed for the closing block, and to lay the shoe in, whilst sewing.
B. The closing block.
C. A loose bed to lay the shoe in whilst stitching; the lower part of which is here exhibited reversed, to show how it is placed in the other bed, A.
D. The

D. The hollow or upper part of the loose bed C, in which the shoe is laid whilst stitching.

E. A table on which the tools wanted are to be laid.

F. An iron semicircle, fixed to each end of the bed A, to allow the bed to be raised or depressed. This half circle moves in the block G.

H. Another iron semicircle, with notches, which catch upon a tooth in the centre of the block, to hold the bed in any angle required. This semicircle moves sideway on two hooks in staples, at each end of the bed.

I. The tail or stem of the bed A, moving in a cylindrical hole in the pillar, enabling the bed to be turned in any required direction, and which, with the movement F, enables the operator to place the shoe in any position necessary.

K. The pillar, formed like the pillar of a claw table, excepting the two side legs being in a direct line, and the other leg at a right-angle with them.

L. The semicircle H, shown separately, to explain how it is connected with the staples, and how the notches are formed.

M. The tail or stem of the bed A, and the lower part of the bed N, shown separately, to explain how the upper part of the bed is raised or depressed occasionally.

A BOUNTY of THIRTY GUINEAS was this Session voted to Mr. WILLIAM HARDY, No. 61, Chapel-street, near White-Conduit-House, for his method of BANKING the BALANCE of a TIME-KEEPER.

The following COMMUNICATION was received from him, and a MODEL of this Invention, reserved in the Society's Repository for public inspection.

SIR,

THIS letter is accompanied with a Drawing, a Description, and a Model, of a more perfect mode of banking the Balance of a Time-Keeper, than any that has yet appeared; and its application to a time-keeper is a matter of such real importance, that the most accurate, without this most necessary appendage, is liable to such derange-

ment, that from the most trivial cause, it is in one moment rendered useless.

To preserve the good qualities of the time-keeper, on which often the strength, the wealth, the grandeur, and safety of this great empire depend, I deem it necessary that my invention should be laid before the Society of Arts, as the means of its being more generally known; and I hope that I show proper respect to the Society, when I assure you that I do not offer any crude idea; neither could I think of giving you any trouble, until I had fully verified the utility of my contrivance by several years trial. As I can produce the testimony of some of the most eminent watchmakers in favour of my invention, I look forward with some degree of confidence, in expectation of obtaining the approbation of the Society.

It was at first imagined, that a banking to a watch with a free escapement was quite unnecessary, as the limits of bank-

ing

ing were so great as to admit of almost twice 360, or 720 degrees; but, on trial, the balance was frequently found to exceed this quantity, and that a very slight motion given to the time-keeper (particularly when the axis of the balance became the axis of that motion), was sufficient to alter the strength and figure of the pendulum-spring, and position of the pieces in respect of the balance-wheel, so as to change the rate of the time-keeper; and, what was worse, require a new adjustment of the balance, to accommodate itself to the changes made in the spring, and other parts connected with it. Hence it became necessary, that some means should be used to stop the balance at certain limits beyond its natural arch of vibration; and various attempts have been made to effect it. One way is, by a moveable piece on the axis of the balance, which banks against a pin, yet so as to suffer the balance to vibrate more

than 360 degrees. Another method is to have a piece moveable on a centre in one of the arms of the balance, and applying itself as a tangent to the pendulum-spring, which passes through a hole in the piece. It has also a knee, which almost touches the plate, and just passes free of a pin placed in it. But when the balance vibrates so as to approach its utmost limits, the action of the spring, while in a state of unwinding, throws the piece outward, so as to fall in the way of the pin, and stop the balance from proceeding farther. Another mode is by a straight spring, screwed upon the plate, having a hook at the end of it, into which a pin placed in the balance strikes, when, as before, the pendulum-spring, in unwinding, touches the straight spring, and moves it a little outwards. There is also a way of banking by means of a bolt, which is thrown back by the pendulum-spring, and made to fall in the way of a pin

placed

placed in the rim of the balance. These are the principal modes of banking now in use, and they do not differ materially from one another in principle. But the weight and friction of so many pieces, on so delicate an organ as that of a pendulum spring, are perhaps nearly as hurtful to the time-keeper as the injury it may sustain when it is left without any banking whatever.

I am, Sir,

Your most obedient servant,

WILLIAM HARDY.

No. 61, *Chapel-street, near White-Conduit-House,*
Jan. 18, 1804.

CHARLES TAYLOR, Esq.

DESCRIPTION *of a new and most accurate* MODE *of* BANKING *the* BALANCE *of a* TIME-KEEPER, *Plate X. Fig. 1 and 2.*

In *Figures* 1 and 2 the same letters are placed, to signify the same things. A A is the balance to which the pendulum-spring is fastened in the usual way. In one of the crosses of the balance is placed a pin P, which stands a little way above its surface; and when the balance is caused to vibrate a complete circle, the pin in its motion will describe the dotted circle P O Q, and just pass clear of the inside of a projection formed on a cock B, which is fastened on the plate by means of a screw. At about one-fourth of a turn of the pendulum-spring, reckoned from its stud E, is placed a very delicate tapering piece of steel S, having a small hole in it, through which the pendulum-spring passes; and it is fastened to it by means of

Mr. Hardy's Method of banking the balance of a Timekeeper.

Fig. 1.

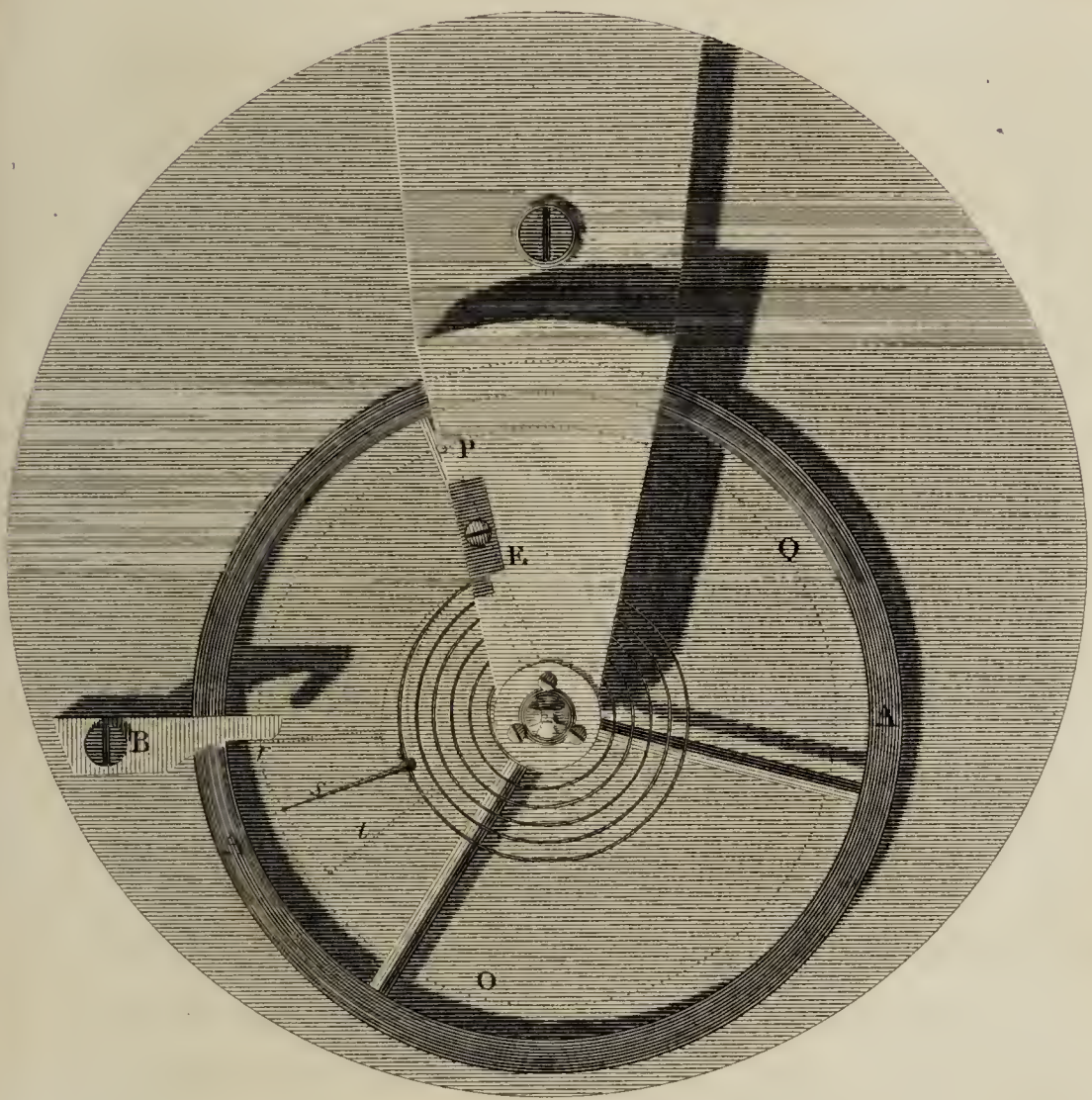
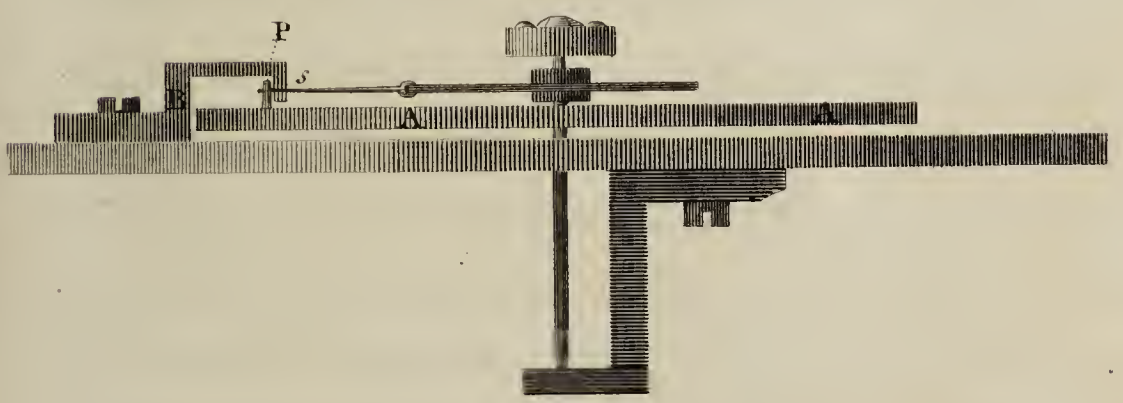


Fig. 2.



Lowry sculp.

of a pin, and stands perpendicular to the curve of the spring. Let the balance be at rest, as represented in *Fig.* 1, the banking-pin at P, and the banking-piece at *s*. Suppose the balance is made to vibrate from P towards O, when P arrives at the banking-piece *s*, it will pass it without touching, because its extremity *s* lies wholly within the circle traced out by the banking-pin. But when the banking-pin P has arrived at Q, the banking-piece *s* will have advanced to *t*, by the pendulum-spring winding itself up into the figure represented by the dotted curve; and when the banking-pin P (now at Q) returns back to P, and passes on from P towards Q, to approach B, and so complete the other half-arch of its vibration, before P can arrive at the banking-cock B, the pendulum-spring will have unwound itself into the figure described by the dotted curve, and the banking-piece *s* will have advanced into the position

position at *r*, just touching the banking-cock. Its extremity *r*, however, being thrown beyond the dotted circle, must necessarily fall in the way of the banking-pin, which arrives there almost at the same moment, and is opposed by it, without the slightest shock to the pendulum-spring. The model renders any farther explanation unnecessary.

WILLIAM HARDY.

No. 61, Chapel-street, near White-Conduit-House,
Jan. 18, 1804.

A BOUNTY

A BOUNTY of THIRTY GUINEAS was this Session voted to Mr. J. M. ELLIOTT, No. 19, Aylesbury-street, Clerkenwell, for his improved REPEATING-WATCH.

A MODEL of his invention is placed in the Society's Repository, for inspection, with DRAWINGS and DESCRIPTIONS thereof.

The following COMMUNICATION was received from him, and an EXPLANATORY ENGRAVING is hereunto annexed.

SIR,

ON Wednesday next I purpose, by permission, to lay before the Society for the Encouragement of Arts, &c. a Repeating Watch on a new and very simple principle, without pinions, pullies, chain, or racks. It will repeat the hour and the quarter, the hour without the quarter, or the quarter without

without the hour; the hour first, and the quarter afterwards, or the quarter first, and the hour afterwards, or the hour and the quarter without intermission, with one hammer only. The above-mentioned Watch has met the approbation of mechanical and scientific gentlemen; several having been made for the Turkey, Irish, and American trade, as likewise for home consumption. The Watch will be at the same time accompanied with a Drawing and Description of the same.

I remain,

Your most obedient servant,

J. M. Elliot.

Feb. 4, 1804.

Charles Taylor, Esq.

SIR,

SIR,

HAVING for some years had in contemplation repeating watches, and considering the great expense in the first purchase, and the continual expense of repairs, I was induced to turn my thoughts to the subject, in order, if possible, to reduce them to a much simpler principle, and prices considerably lower; and from models that I have frequently made, and experiments upon them, I flatter myself that I have made several useful improvements thereon. It is well known, that repeating watches have always been, and are at this time, in the hands of few, and in such hands they appear to me more for show and ornament than of any real use; but the middling class of mankind, to whom they are of the most service, are deprived of their benefits. From motives

motives of this kind, the model, the result of my labour, and one upon my last improved plan, are sent for the inspection of the Society of Arts, and for the good of the public.

The method of using the new repeater is as follows:—Hold the watch in the left hand, and apply the finger and thumb to the pendant; and if it is required to repeat the hour, turn it to the right, till it gives a full stop. But if it is to repeat the quarter, turn the pendant to the left, till it gives a full stop, as in winding up a common watch.

In the last place, I shall give a comparative view of the superiority of these new repeaters to the old ones, for the interval of twenty years.

The expense of the old repeater, in the purchase - - - -	£30 0 0
Cleaning at half-a-guinea per year, for twenty years - - - -	10 10 0
Total amount -	£40 10 0

The

The expense of the new repeater in the purchase - - - -	£8	8	0
Cleaning at 5s. per year, for twenty years -	5	0	0
Total amount -	£13	8	0
Which makes a saving to the purchaser of	£27	2	0

Perhaps it may be observed by some mechanical gentlemen, that the model under consideration is not finished in so superb a manner as might have been expected; but in order to obviate every difficulty that may arise, I shall only say, that it is not exhibited as a fine piece of workmanship, but as a piece of mechanism; and, as such, I have taken the liberty of laying it before the Society for the Encouragement of Arts, &c. trusting that they will allow it as much merit as it deserves.

J. M. Elliot.

Feb. 20, 1804.

Charles Taylor, Esq.

SIR,

SIR,

I HAVE herewith sent you a Drawing of the last Improvement of my Repeating Watch, which you will find upon a much simpler principle than the Model left; as I have entirely got rid of the system of parts contained between the plates. I need not expatiate on its utility, that being fully explained in the Drawing annexed. My repeating movements can be added to an old watch for the sum of three guineas, if it is to be a dumb repeater. With a further addition of three guineas, I can furnish my repeating work with a bell and new metal cases.

I remain, Sir,
Your obedient servant,
J. M. ELLIOT.

March 25, 1804.

CHAS. TAYLOR, Esq.

REFERENCE

Reference *to the* Engraving *of Mr.* Elliot's Repeating Watch.—*Plate XI. Fig.* 1 *and* 2.

Fig. 1.—Let A B represent the pillar plate, viz. its upper side. C D, a circle of steel, moving freely in the steel pullies E F G H. This steel wheel is put in motion by means of a small wheel *a*, fast on the axis, which goes through the pendent, which acts in the teeth on the under side of the circle represented by the dotted arch *b*. I is the the quarter-snail. K the minute-wheel. The hour-wheel may easily be supposed, therefore requires no description. L is part of the hour-snail, which is not drawn complete, by reason that it would intercept the view of the rack of the steel circle at Q. O is the locking lever. P the end which falls upon the hour-snail, to regulate the number of strokes it is to strike; at the same time, the end Q of the lever O

locks into one or other of the notches in the steel circle. The star-wheel, No. 1, is rivetted or screwed to the hour-snail, and moved by the small arm, No. 2, on the canon pinion. M and N are the jumper and spring. R is the quarter locking lever. S the end that falls upon the quarter-snail. T the locking end, which locks into the notches at *h*. At *x* is a pin in the steel circle, to which is hooked a chain, and the other end to the barrel V. This chain, when the pendent is put in motion, will unwind from the barrel, and, by acting between the steel rollers U W, will work both to the right and left. *i*, *k*, are small pallets, on which are the tails of the hammers, acted upon by the pins as per figure, so that at the end of the strokes that have struck, the spring in V will draw back the steel circle, and the pins will pass by the hammer-tail, and a small spring under *l* will bring it into its proper place.

EXAMPLE.

Mr. I. M. Elliot's Repeating Watch.

Fig. 1.

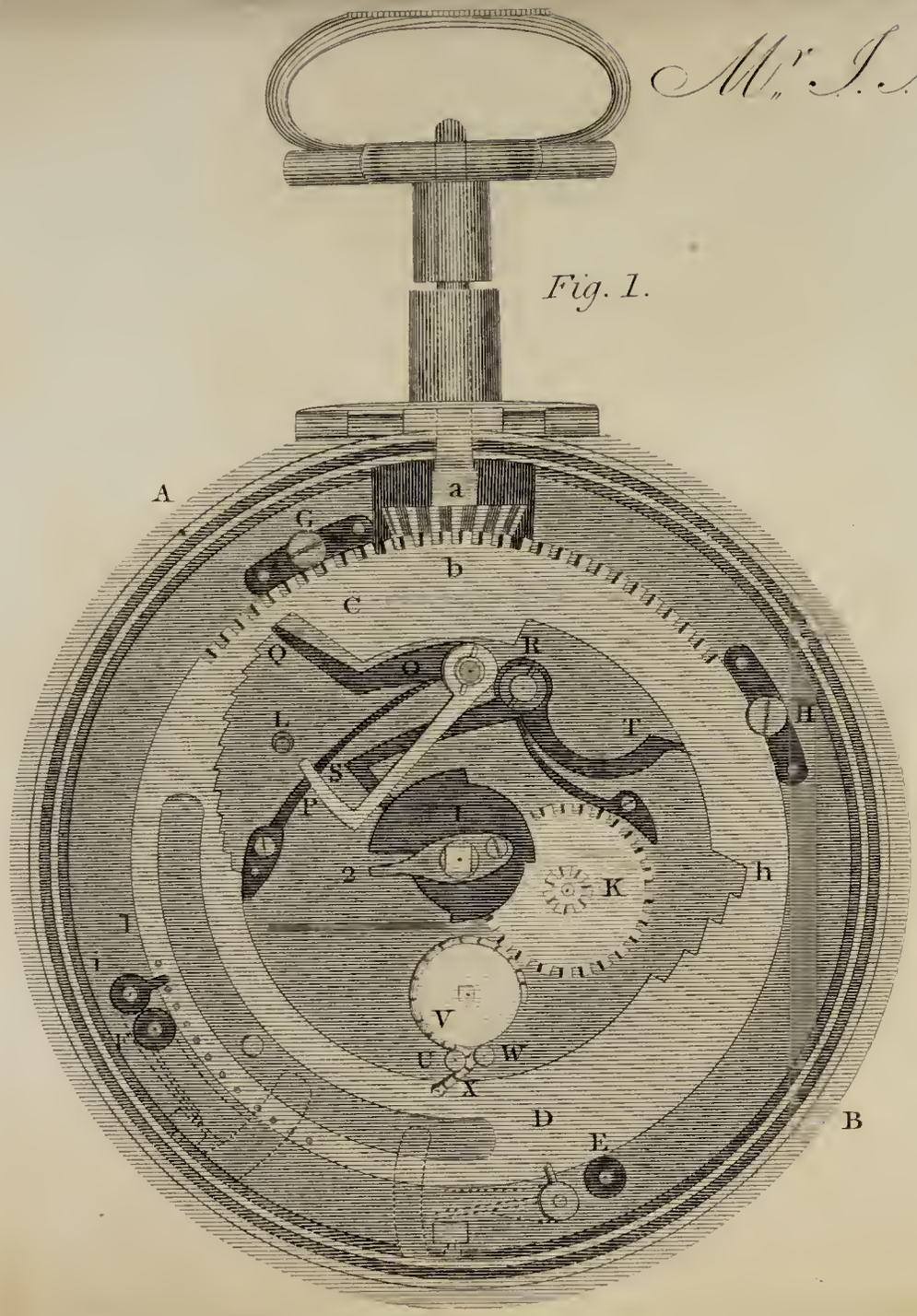
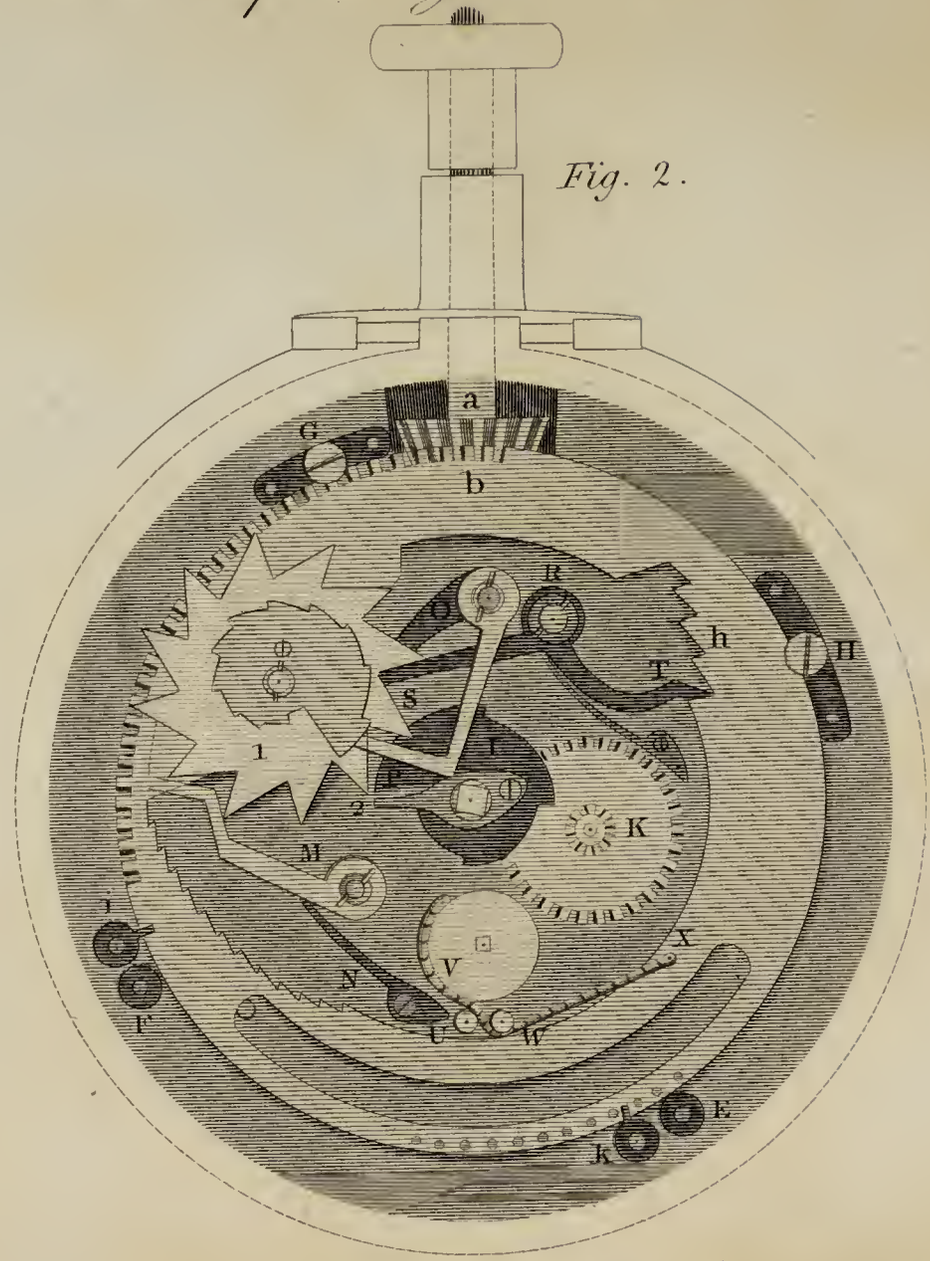


Fig. 2.



EXAMPLE.

I hold the watch in my left hand, and with the right I turn the pendent to the left, to strike the hour. The point P will fall on some part of the hour-snail; at the same time the point Q will stop the steel circle. The hammer of course will give the hour. The same is to be understood of the quarters; only observe to turn to the right.

Fig. 2 explains, by similar letters, in another view, the same parts of the watch, in order that its construction may be more easily comprehended.

Fig 1

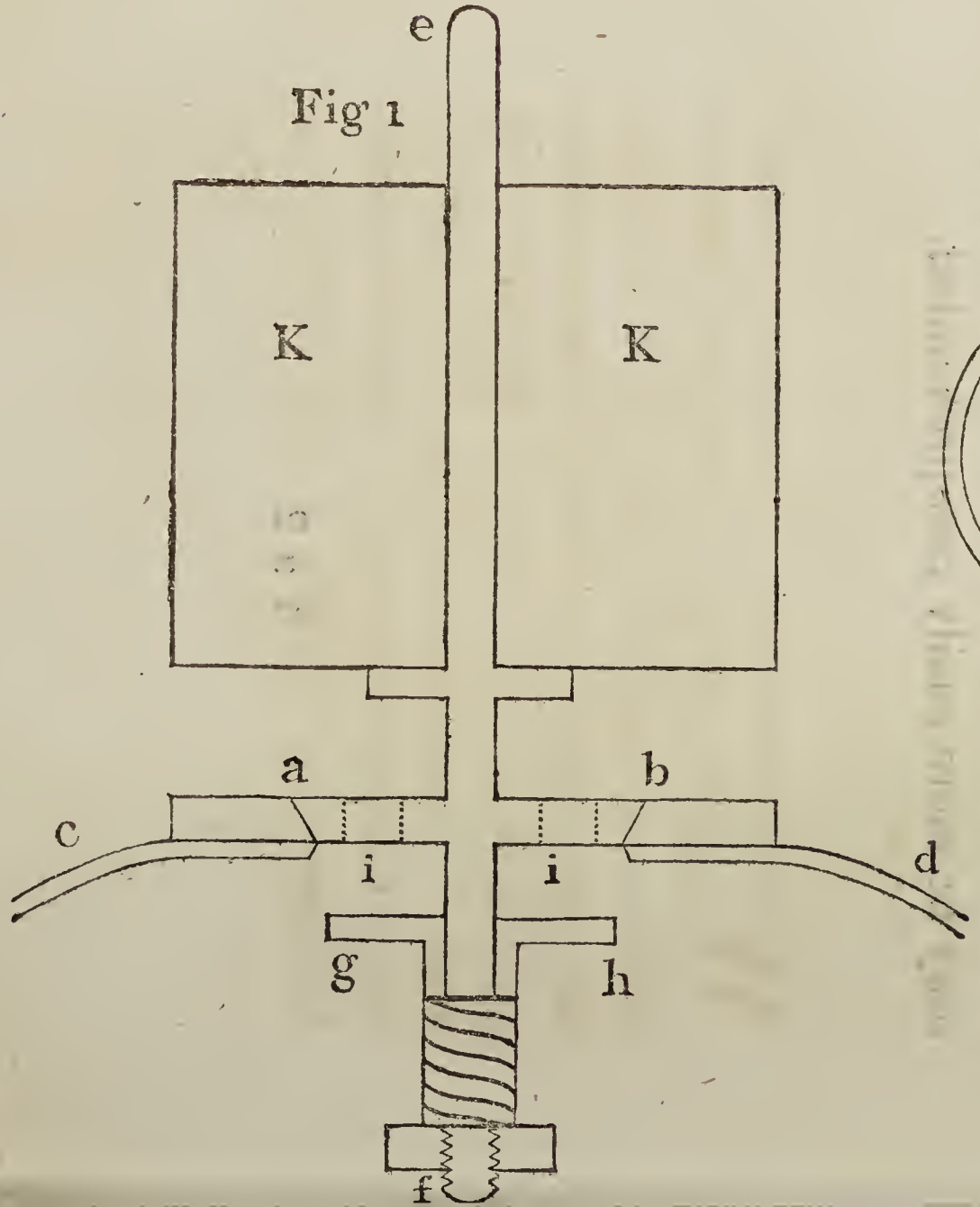
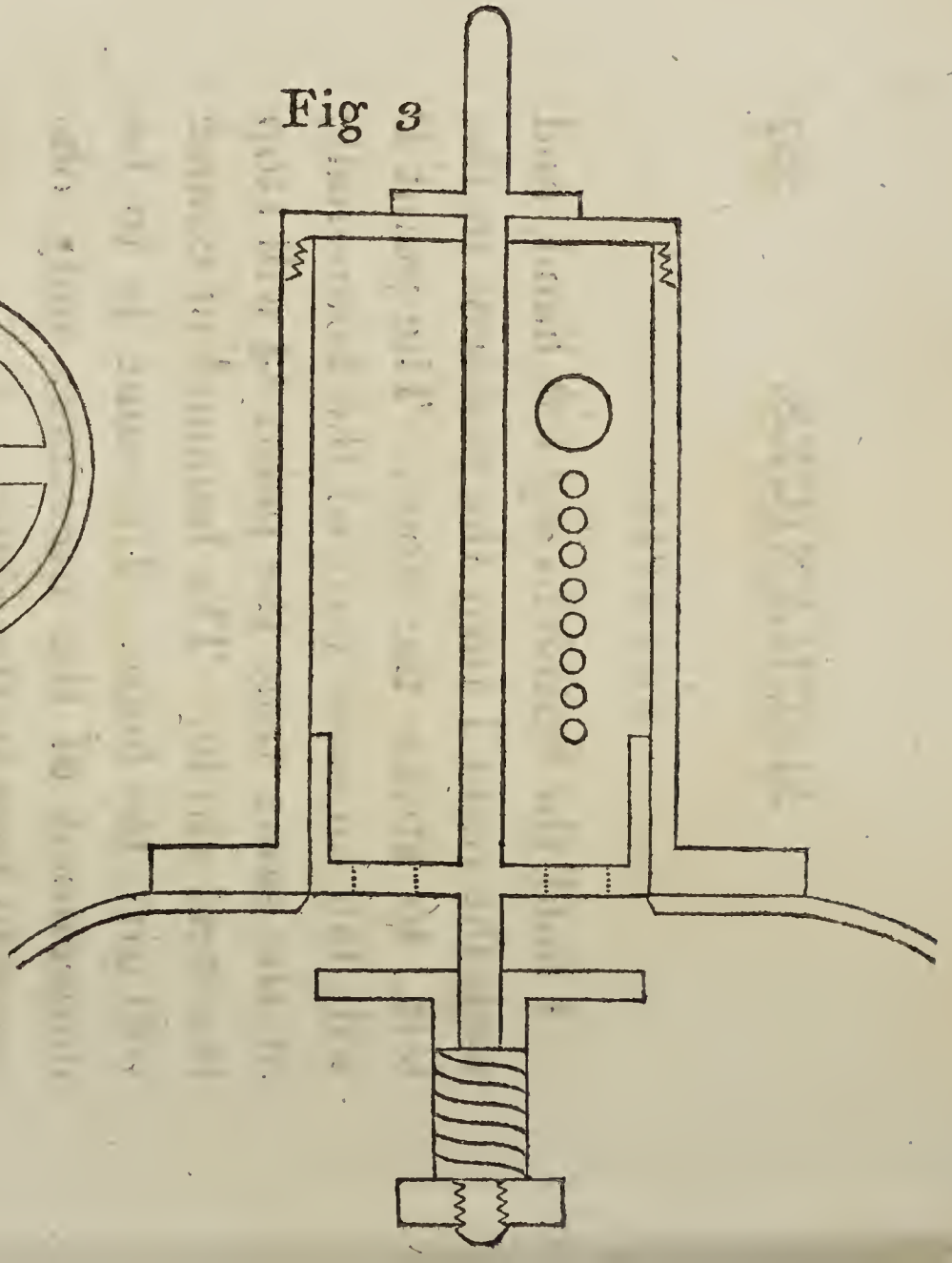


Fig 2

Fig 3



The SILVER MEDAL of the Society was this Session voted to the Chevalier A. N. EDELCRANTZ, of Sweden, for an improved SAFETY VALVE for STEAM ENGINES; from whom the following ACCOUNT was received, and to which an ENGRAVING on WOOD and DESCRIPTION are annexed. The statical Lamp mentioned has since been received, and is placed in the Society's Repository.

SIR,

WITH this you will receive a Drawing and Description of a Safety Valve, of my invention, which unites the advantages of the two valves now generally used in Steam Engines, and will, I hope, be found deserving the attention of the Society. In a short time I purpose to present to the Society my

new-invented statical Lamp, which I shall request them to accept, and am,

SIR,

Your obedient Servant,

A. N. EDELCRANTZ.

London, Feb. 12, 1804.

CHAS. TAYLOR, Esq.

DESCRIPTION *of a* SAFETY VALVE, *containing a Vacuum Valve in the same Hole of the Boiler.*

In large boilers or coppers, where boiling fluids are enclosed, a *safety valve* is generally used to prevent their bursting, from an unexpected excessive force of the elastic steam, and, besides, a *vacuum valve*, to prevent their being compressed or crushed by the weight of external air, in the case of a sudden condensation of the vapours. These two valves are commonly fitted in two different holes in the boiler; but as a more

more simple, and consequently more eligible, method seems to be that of joining them together, I take the liberty to submit to the Society for the Encouragement of Arts, &c. the following contrivance for that purpose:—

a b, *Plate XII. Fig.* 1, is a common conical safety valve, fixed in the boiler *c d*, having four openings, *i i*, which are represented in a plan view in *Fig.* 2. *e f* is the metallic rod, bearing the weight K K, with which the safety valve is loaded, and extending itself under that valve to *f*: *g h* is the *vacuum valve*, consisting in a plane circular plate, with a brass tube sliding along the rod, and pressed by a spiral spring to the safety valve *a b* (against which it has been well ground in making it), closing in that situation the openings *i i*.

Such being the construction of the whole, it is evident, that when the elasticity of the steam increases, the two valves, joined together, with the holes

 i i shut,

i i shut, make but one, opposing to the elasticity of the steam an united resistance, which is regulated by the weight *k k*, in the common way; but, on the contrary, when by condensation of the vapours a vacuum is produced, the external air in pressing through *i i*, upon the vacuum valve *g h*, forces it down, and opens to itself a passage into the boiler.

The valve *g h* may easily be made conical, like the other, if that form should be preferred; but in different trials, I have found planes, if well turned and ground together, join as perfectly as can be desired, being pressed by the united elasticity of the spring and the steam.

Fig. 3 is the same contrivance adapted to a new kind of *safety valve* or *piston*, which, though I originally intended it for the use of Papin's digesters of a new construction*, has been, in a larger

* Nicholson's Journal, March, 1804.

size,

size, applied by me even to steam engines, and is described in the Philosophical Magazine of December, 1803.*

I have lately begun, and shall pursue, a set of experiments, with the intention of regulating by this safety piston, the quantity of admitted air to fire-grates, and to effect, by that means,

* The description of this contrivance being already published, it would be superfluous to repeat it. I only beg leave to add the following practical remark. A metallic piston, if well turned and fitted into a cylinder of exactly the same kind of metal, will probably have the same degree of expansion, especially if hollow, and consequently will not increase its friction in any increased degree of temperature. But as in practice the cylinder is commonly exposed to a lower temperature than the piston, heated by the steam, a little increase of friction will take place by an increase of heat. To prevent the effect of this, I have found it useful to employ for the piston a metal of somewhat less expansive powers than the cylinder: and the expansion of red copper being to that of brass nearly as 10 to 11, I prefer making the piston of the former metal, when the cylinder is made of brass.

a new

a new mode of regulating the fire, and the elasticity of steam in boilers, with less expenditure of fuel and of force than usual; of which idea a hint is given in the work and place above mentioned. The result of these researches, I shall at some future period do myself the honour of communicating to the Society.

The

The SILVER MEDAL of the Society and FORTY GUINEAS were this Session voted to Mr. GEORGE WALBY, of Goswell-street, near the Turnpike, for his Invention of a FORGE-HAMMER, with great power for working metals, and worked by one or more men occasionally.

An ENGRAVING and DESCRIPTION thereof are annexed.

The following COMMUNICATION was received from him.

SIR,

I TAKE the opportunity of laying before the Society a drawing, accompanied with a description, of a new-invented Hammer, for the purpose of forging bricklayers trowels, rounding of ships bolts, beating gold or tin foil, planishing brass, copper, &c. or for any other work in which a large hammer may be required upon a simple principle.

principle. The weight of the hammer is seventy pounds, which may be worked by one man, with the speed of three hundred blows per minute, with the greatest accuracy and ease, and it performs the work of two or three men. The steel is kept in better temper by this hammer, as it requires fewer heats in doing the same work than in the common way.

The trowels made by me with it will bear any pressure or bending, and return by their elasticity to their original shape, and they will even cut a chip from a bar of solid iron, without hurting their edge; they are lighter and more handy than common trowels, and serve much longer in use.

I am, Sir,

Your obedient humble servant,

GEORGE WALBY.

Near Goswell-street Turnpike,
April 20, 1803.

REFERENCE

(Mr. George Walby's Hammer for Iron Work ?)

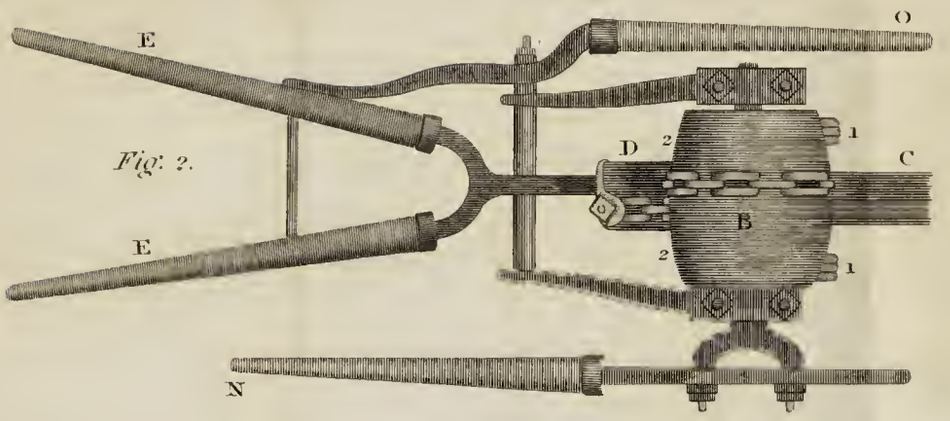


Fig. 2.

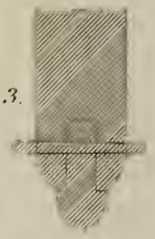
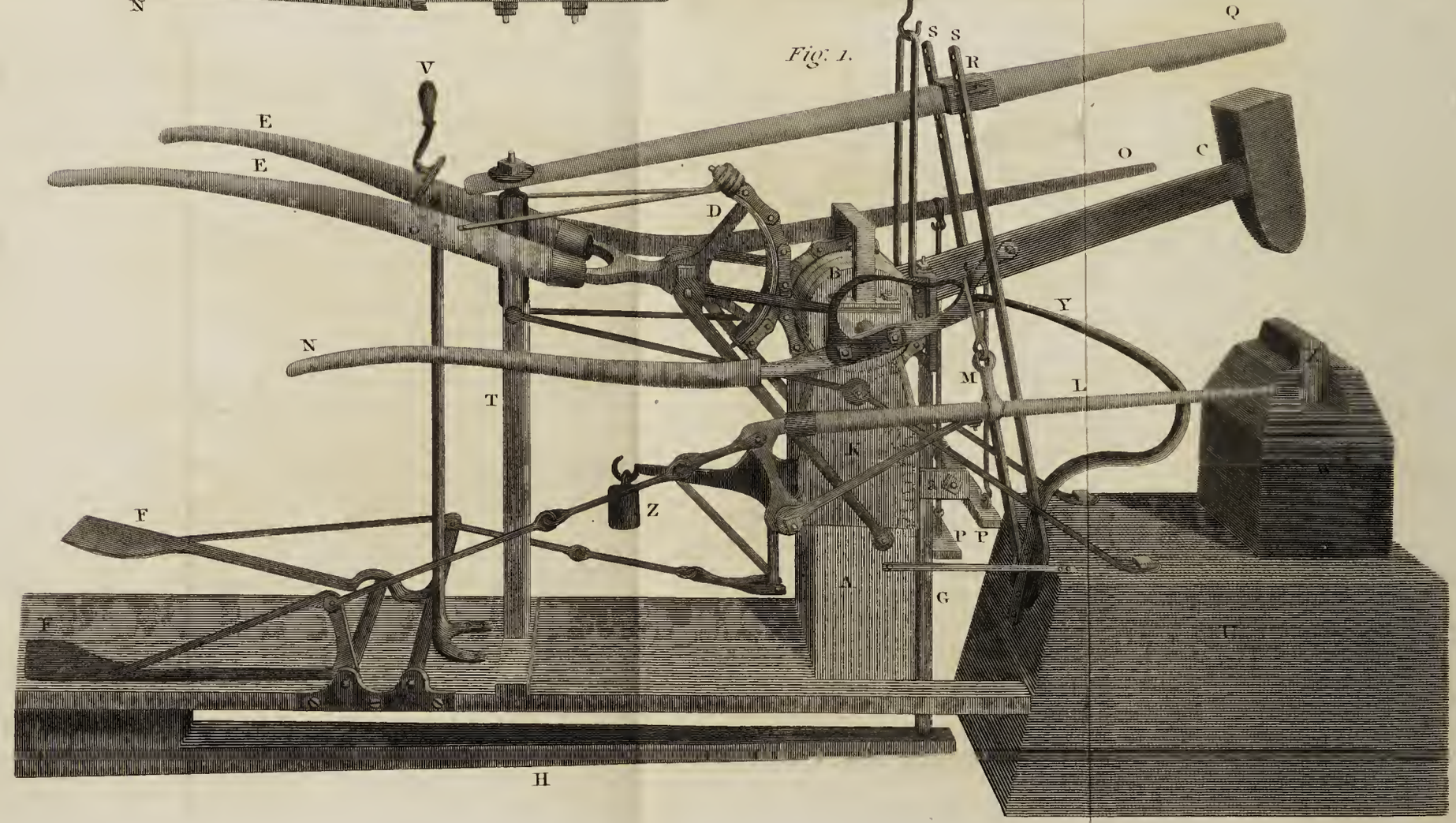


Fig. 3.

Fig. 1.



C. Varley del.

S. Porter sc. 4 Weston Street Penton

REFERENCE *to the* ENGRAVING *of Mr.* WALBY'S *Hammer-plate.* — *Pl. XIII. Fig.* 1 *and* 2.

Fig. 1.—A. A block of oak, in which the hammer acts.

B. The wheel or nave, in which the hammer-handle C is fixed, also the chains which give motion to the hammer by the quadrant D.

E E, Are the two levers which work the quadrant D.

F F, Are the two pedals on which the man who works the machine treads alternately, holding the levers E E in his hands; when he treads on the right pedal F, he lifts the hand-levers E E, which motion raises the hammer C; when he treads on the left pedal, he presses on the same levers, which motion lets fall the hammer.

G, Is a rack, which moves perpendicularly by the action of a strong wooden

wooden spring H, placed in a trough underneath the centre of the machine; the rack is kept close to the quadrant K by a bridge *a*, containing a small friction roller.

I. An additional steel spring, fastened to the ceiling over the machine, in order to assist the wood spring H, when fewer hands are at work.

K, Is the quadrant contained in the centre of the oak block A, under the nave B, which assists in raising or depressing the hammer by the alternate actions of the pedals F F.

L, Is a lever fixed on the axis of the quadrant K, which, at the time it depresses the rack G, pulls upon the hammer-handle C, by the chain M, which adds to the power of the blow.

N O, Are the two side levers to be worked by two men, when more power is required.

P P, Are

P P, Are other two pedals on which a man treads alternately, to give motion to the hammer, having an upright rod or chain to each pedal; one rod is connected from the right pedal P, to the lever O, which raises the hammer; the other rod, from the left pedal P, is connected to the handle of the hammer C; when the man treads on the left pedal P, he acts upon the hammer C, and, by lifting the lever O with both hands at the same time, adds double power to the blow.

Q, Is a wooden spring or stop, which prevents the hammer rising too high, and accelerates the fall.

R, Is a bridle, which supports the wooden spring Q.

S S, Are two iron standards, with holes in each, to raise or fall the said spring.

T, Is a wooden standard to support one end of the wooden spring Q.

V, Is

V, Is a steel tempered spring standard to support the hammer whilst out of action; it also gives ease to the springs, and prevents the heat of the anvil from softening the face of the hammer.

U, Is a solid block of oak on which the anvil stands.

W. The anvil, with a hollow dove-tail on the top for the reception of different faces, as the various kinds of work may require.

X. A steel face, dove-tailed in the anvil.

Y. A steel spring, which lies beneath the hammer-handle, but only touches it when the hammer falls: this spring, when the heated metal is laid upon the anvil, and in a soft state, prevents the hammer falling upon it with its full force. It gives a recoil to the hammer, and permits the workman to modify or shorten the

the stroke of the hammer with quickness, ease, and regularity.

Z. A weight hung on the arm of the quadrant K, in order to counteract the power of the hammer occasionally, when light work is to be forged.

Fig. 2, Is a bird's-eye view of the hammer-wheel, and is marked with similar letters, to show the same parts. 1. 1. Are chains by which the rack G raises the hammer. 2. 2. Are chains which raise or depress the hammer by the motion of the levers E E.

Fig. 3, Is a hammer-head, with a face let into it; and which face may be taken out and changed to suit different work.

PAPERS

IN

COLONIES AND TRADE.

COLONIES AND TRADE.

The GOLD MEDAL of the Society was this Session voted to ISAAC WINSLOW CLARKE, Esq. of Montreal, in Canada, for his CULTURE and PREPARATION of HEMP in that Province; and for the Importation of upwards of two thousand five hundred weight thereof into the port of London, as certified by the following ACCOUNTS.

SIR,

I BEG leave to lay before the Society for the Encouragement of Arts, &c. the enclosed observations on manufacturing into cordage and twine about 2580 pounds weight of hemp, raised by J. W. Clarke, Esq. last year, upon his farm, near Montreal, in Canada.

I send also a small coil of rope made from this hemp, and a sample of it in the rough state; and I hope that the

Society, with a view to the encouragement of an object of such national importance, as the cultivation of hemp in our own colonies will confer upon Mr. Clarke a suitable reward for his very laudable exertions.

I am, Sir,
Your obedient servant,
JOHN BRICKWOOD, jun.

P.S. The following experiments and observations have been furnished me on Mr. Clarke's hemp.

Billiter-square, July 18, 1803.

CHARLES TAYLOR, Esq.

Observations on CANADA HEMP, *by Mr.* ROBERT RICH, *Rope-maker, Dock-head.*

Respecting the Hemp imported from Canada, I have to observe, that having worked it, I find it extremely foul and clung, which is owing to its not being properly bracked.

I have

I have no reason to alter my opinion as to the strength; and I also find that it will take a sufficient quantity of tar for its preservation for maritime uses; but from the foulness or bad brackage, it will not make such handsome cordage as the Petersburgh hemp; neither, till that complaint is obviated, will it be able to stand in competition with it in this, or any other market.

The Petersburgh hemp in general is divided into sundry classes, which comprehend

Petersburgh clean, or best staple hemp.
Ditto outshot, second, or trifling inferior.
Ditto half-clean, third, inferior.
Ditto Codilla, worst, or rooty parts.

All which have different prices in the market, and the Canada hemp I have been working has all these qualities together; which proves the necessity of better bracking or dividing the qualities, so as to render it marketable. It is also farther necessary to remark, that

more attention must be paid to the packing or tying it up together, so as to make the beds or head layers of a more general length, and to tying them up more firm and compact, which will conduce to render it more saleable.

As a proof of the general strength of it, I have made that kind of trial of it, adopted by Government, and required by them in their contracts, and find that out of sixteen threads which I tried, the whole separately carried the three-quarters of a hundred, which is the weight required by them at three feet length; and that fifteen of the sixteen carried one hundred weight, and would have carried more.

Observations on CANADA HEMP, *by Messrs.* WM. *and* GEO. FOWLER, *Twine and Net Makers, Bridport.*

Presuming it to be your wish we should state the observations we have to

to make on this hemp, and the opinion we have formed of its qualities and value, from the experiment we have made on it, we shall proceed to do so somewhat particularly.

We observe it is very long, rooty, and foul. Its length exceeds any we have seen from the Baltic, being nearly equal to what is grown in Italy; whence we conclude that the soil and climate are congenial to its growth; and we see nothing in its strength or texture that militates against this opinion. In these latter qualities, and also in its colour when dressed, it resembles what is grown in this county, and the neighbouring parts of Somersetshire, more nearly than any we have seen from any other country. In length it exceeds our country produce, as well as the Russian, with which ours in this respect nearly corresponds. Its great length, however, does not increase, but diminish, its value for our manufactures, and we think must

must do so for any other, there being no manufactory with which we are acquainted, for which our own and the Russian growth are not sufficiently long. Indeed, if this hemp were broken, like the Russian, into assortments, and kept distinct, the first assortment would of course be materially reduced in length, and thereby rendered more valuable, although it should be no better cleaned from the stalk than the present; and still more so, if it was made more clean in this respect, and the rooty parts taken away, which we conceive to be very practicable. The defects in these two last respects in the present parcel, and the loose manner in which it appeared to be packed, we ascribe to the infant state of its culture and management, and conclude these will naturally be corrected by a longer practice, especially if aided by a few experienced men, and stimulated by proper encouragement.

Its

Its extreme rootiness may perhaps be occasioned by the hemp growing too thin on the land, owing either to an insufficient quantity of seed being sown on it, from a part of it being defective from age or damage in the principle of vegetation, or to its being picked up from the land by birds, which in general are very fond of this seed.

On account of its being so foul and rooty, the expense of preparing it for our manufactures is necessarily much increased, and its produce considerably lessened; but when properly prepared and well managed in the subsequent processes, the twines, &c. will, in our opinion, be equal, if not superior, to those made from the best assortments of Russia hemp. Those calculated for the fisheries, especially, we believe, will make stronger and more durable nets than any Russian hemp whatever. We could not, however, have brought the twines to this perfection, with this parcel

of

of hemp, without the assistance of the machinery we possess.

A Certificate, signed by Mr. J. Beck, Surveyor at the Custom-House of Montreal, in the province of Lower Canada, states—that five bales, containing 2586 pounds net weight of hemp, the product and manufacture of Montreal, in the province of Lower Canada, were shipped on board the Britannia, William Thompson, master, bound for London, on the 28th of June, 1802, by Isaac Winslow Clarke, Esq.

The

The GOLD MEDAL of the Society, or ONE HUNDRED DOLLARS, at his option, were this Session voted to Mr. JACOB SCHNEIDER, of York, in Upper Canada, for his CULTURE of HEMP in that province.

SAMPLES of the HEMP and SEED are reserved in the Society's Repository, and the following COMMUNICATION was received from him.

SIR,

ON account of Jacob Schneider, a farmer of this place, I transmit you Governor Hunter's Certificate, with the Affidavits and other Vouchers, relative to the man having raised a certain quantity of hemp, &c. &c.

Agreeably to the mode advertised for cultivating the same, to obtain the bounty, I also forward at this time a keg, containing 28 lb. of hemp,

and

and 2 lb. of hemp-seed to your address. It will not reach you till next season. When it does, if it proves sufficient to entitle the man to any thing, either premium or bounty, you will please to transmit whatever it may be to me, on his account.

I have the honour to be,

SIR,

Your most obedient servant,

W. ALLAN.

York, Upper Canada, Nov. 18, 1802.

CHAS. TAYLOR, Esq.

Upper Canada.

I, PETER HUNTER, Esq. Lieutenant-Governor of the province of Upper Canada, do hereby certify to the Society established for the Encouragement of Arts, &c. that it has been declared to me upon oath, that Jacob Schneider, of the township of York, in the home district

district of this province, yeoman, did, at the end of May, in this present year, sow in drills eighteen inches apart, hemp seed, on six acres, in separate fields (containing three acres each), in the said township; and did, during the last ten days of September following, pull the male hemp on the said six acres, and did continue the winter hemp on the same, until the seed was ripe, which was in the end of October and beginning of November, when the said hemp was pulled. That the said six acres, during the third week of May preceding, were ploughed and sown the week after: that one of the fields was of a rich loamy soil; the other of a soil rich, but sandy; and that the produce amounted to two hundred averdupoise weight of hemp on each acre, the expense of cultivation being about ten shillings for every acre of the said lands.

Given at York, under my hand and seal at arms, this 17th day of November,

November, in the year of our Lord, 1802.

P. HUNTER, Lieut. Gov.

SIR,

ACCEPT my thanks for the trouble you took in enclosing me the two lists of Premiums offered by the Society, which afford satisfaction in this country to many who have no other opportunity of seeing them. There is every probability, that the culture of hemp for exportation from this country, more particularly from the province of Upper Canada, will eventually have the desired effect; and the more support it receives in its infancy, the sooner will this be ascertained.

There has been a very considerable quantity exported this present year, and many affidavits state its being cultivated at a small expense.

I rest

I rest assured, that the keg will reach you before the end of the year. In that case, Mr. Schneider will have his chance of success.

I have the honour to be,

SIR,

Your most obedient servant,

W. ALLAN.

York, Upper Canada, Nov. 19, 1803.

CHARLES TAYLOR, Esq.

The SILVER MEDAL of the Society, or EIGHTY DOLLARS, at his option, were this Session voted to Mr. DANIEL MOSHER, of Kingston, in Upper Canada, for his Culture of HEMP in that province.

SAMPLES of the HEMP and SEED are reserved in the Society's Repository.

The following COMMUNICATION was received from him.

SIR,

I AM instructed by Lieutenant-General Hunter, Lieutenant-Governor of the province of Upper Canada, to state to you, that several individuals in this province have, with some degree of success, attempted the culture of hemp, notwithstanding the difficulty of procuring seed, and other obstacles, which, in a country similar to this, cultivators, in attempting any thing that is new, must necessarily meet with.

The

The Lieutenant-Governor has granted certificates in favour of some cultivators, who are ambitious of the honour of obtaining the premiums held forth to this province by the Society for the Encouragement of Arts, &c. These certificates, however, have not been drawn up according to the rules prescribed, as the cultivators (although the facts stated by them were true, and sufficiently authenticated) did not come prepared with the documents required to substantiate their claims.

The difficulty in communicating the necessary instructions to the different parts of this province; the want of attention, even the ignorance of many of the cultivators, some of them not understanding the language in which these instructions are conveyed, have unavoidably produced this inconvenience.

The Lieutenant-Governor, however, hopes, that the same public spirit and liberality, which induced the Society to

hold forth these premiums to the cultivators of hemp in this province, will also induce it to overlook their regularity and want of form, which too evidently appear in the steps that have been taken to obtain them.

I have the honour to be, Sir,
Your most obedient servant,
JAMES GREEN, Jun.

York, Upper Canada, Feb. 22, 1803.

CHAS. TAYLOR, Esq.

ACCOUNT *of* HEMP *raised in the township of Kingston, in the year* 1802, *by Mr.* DANIEL MOSHER, *sowed broad-cast.*

	EXPENSE. £.	s.	d.
Sowed broad-cast, on new land well burned, 2¾ acres, 8 perches, not ploughed, but harrowed four times, at, per acre -	0	10	0
One bushel and a half of seed per acre, at 25s. per bushel - - -	1	17	6
Cutting, rooting, and stacking, per acre	1	0	0
Cleaning the hemp, averaging 7 cwt. per acre	2	16	0
Total expense, broad-cast	£6	3	6

ACCOUNT

ACCOUNT *of* HEMP *raised in the township of Kingston, in the year* 1802, *by Mr.* DANIEL MOSHER, *sowed in drills.*

	EXPENSE. £.	s.	d.
Sowed in drills, eighteen to twenty inches asunder, on a black mould, $3\frac{1}{2}$ acres 5 perches, twice ploughed, harrowed four times. Whole expense of drilling, sowing, &c. per acre - - -	2	1	0
Plucking the Summer hemp - -	1	12	0
Rooting and cleaning the Summer hemp -	1	0	0
Cutting, thrashing, and cleaning, the Winter hemp seed - - - -	2	0	0
Expense of one acre	£6	13	0

Note—The produce of one acre of hemp, sown in drills as above,—

The Summer hemp, one hundred and seven pounds.
The Winter hemp, seventeen bushels and a half.

A Certificate from James Ferguson, Esq. one of his Majesty's Justices of the Peace for the midland district of the province of Upper Canada, accompanied the above papers, testifying that the statement contained in them is just and true.

The

The THANKS of the Society were this Session voted to Dr. WILLIAM ROXBURGH, of Calcutta, for the following interesting COMMUNICATION on the Culture, Properties, and comparative Strength of HEMP, and other VEGETABLE FIBRES, the Growth of the EAST INDIES.

DEAR SIR,

YOUR letter of the 16th of May, 1799, I received on my return to Bengal in October last; but that from the Society established in London, for the Encouragement of Arts, &c. of which you are a Member, is not to be found.

I was rather surprised, on my return to Bengal, to find the Directors had sent out a person (Mr. Sinclair) to establish the cultivation of hemp, a thing I had

begun some time before. Even on the coast of Coromandel, ten or twelve years ago, I made a most successful trial, the result of which was laid before that Government, to be sent to the Honourable Court of Directors; and again in Bengal, since my appointment to the station I now hold. Mr. Sinclair is dead, and the experiment is still carried on in a most expensive manner; whereas it could be continued where it was first begun, in the Botanic Garden, at no expense, and with more prospect of success. Should Government continue to be the cultivator, the price will be enormous. Eighty pounds weight is all, I believe, that is yet forthcoming, and costs from 10,000 to 20,000 rupees. Such experiments throw a complete check in the way of all attempts to introduce new, or improve old, branches of agriculture and commerce. A small premium should be offered to the Natives, and honorary rewards to Europeans, after the

the example is set on a small and not expensive scale.

The Botanic Garden was at first made very large, four times more than was necessary for such a garden, the intention of which was merely to make experiments, and to invite the Natives to see and profit by the examples in husbandry carried on there.

A quantity of my bow-string flax was, I understand, sent from the coast about two years ago, for the Directors. I could wish to know what was done with it; for, to me, it seems to be the strongest vegetable fibre we are acquainted with. I mean to send some by the January ships from hence, through the medium of this Government, and wish it may fall into your hands, and that its qualities may be properly examined by the Society for the Encouragement of Arts. I am really sorry that the letter, inviting me to become an honorary corresponding Member of that Society, should

have

have been lost. I beg you will assure the Society, that I am sensible of the honour they have done me, and shall be very happy to have it in my power to contribute my mite to promote the views of that laudable Institution.

When any new object, promising to become useful in the arts or manufactures of our country is discovered, and reported to your Society (for example, the bow-string flax), the Society will probably address the Court of Directors, and recommend the cultivation and importation into England of the commodity itself.

Another object, of more national importance, which I recommended to this Government, before I went to the Cape, was the growth of one of the most noble of the palms, the *arrow*, mentioned in Marsden's History of Sumatra, page 77, and said to yield at an early age (from five to seven years), fibres ready prepared by nature, flexible, strong, and most

most durable, and the most convenient for cables and cordage of all kinds, that can be desired. It also yields great abundance of Palm wine, which can be converted into sugar or ardent spirits; and when the tree is old, its pith is the basis of the Sago we so much value. I have distributed many hundred plants, and have still a great number in the Garden,* beside many thousand seeds in the ground. Drawings, and a description of this most valuable tree, were sent to the Directors, under the name of *Saguerus Rumphii;* but as the trees from which they were taken have advanced in size and age, a new set of drawings, and a new description, or the old one corrected, becomes necessary. They will be sent to the Directors this season. The object may be such as your Society wish to attend to; and on

* Feb. 1801. About 100,000 plants have been reared in this Botanic Garden since the date of this letter.

that

that account I have ventured to trouble you with the above statement.

I am, dear Sir,
Your most obedient servant,
W. ROXBURGH.

Calcutta, Dec. 24, 1799.

ROBERT WISSETT, ESQ.

DEAR SIR,

MY letter of the 24th of December, 1799, I am afraid, has not reached you. The experiments on hemp, therein mentioned, have not, I believe, thrown much additional light on the subject. My friend, Capt. Burrows, of the Earl Howe, has done more to make our own indigenous species (the *sun* of the Bengalese) better known, than any other person I am acquainted with.

For these last twelve months my attention has been much taken up in collecting

lecting and comparing the various vegetable fibres of Asia, &c. used for cordage, cloths, and paper. The result of these I have lately presented to the Supreme Government, to be sent to the Hon. the Court of Directors, in reply to the 79th paragraph of their General Letter of the 7th of May last. This Paper may be interesting to your Society, particularly at this time, when the attention of all good patriots is drawn towards the discovery of a substitute for Russian hemp. This Paper, with my former Essays, contain much information on the subjects therein mentioned.

The *sun* of the Hindoos, which is the prepared fibres of the bark of a well-known Indian plant, the *crotalaria juncea* of Linnæus, still appears to me to be the most promising substitute for hemp which has come to our knowledge; I mean, when every circumstance, relative to its quickness of growth, its being already

already universally known and cultivated by all the nations of India, its low price, pliableness, strength, durability, &c. &c. are taken into consideration. All that can be necessary for the procuring and transporting to England any quantity of this material, is to ensure the cultivator a certain price, and ready market for the commodity; and to have it properly cleaned and packed, to render the freight as low and convenient as possible. Cleaned samples of this very substance were sent by me, six or seven years ago, to the Directors; so that the fault is not mine, if it is not already better known than it seems to be.

The discovery of a substitute for Russian hemp is certainly an object of the first magnitude. If *sun* is found to be the best substitute yet discovered, and costs in India, say, when properly cleaned, ten pounds per ton, and the freight sixteen pounds, there will still be

be a considerable profit to the merchant, particularly in times of war; for, I believe, it rarely happens that hemp sells so low in London as thirty pounds per ton. Should the subject appear of consequence to you, I beg you will call the attention of the Members of your Society to it.

That I may not encroach too much on your time, I will close this letter by referring you to my friend Mr. Boswell, the late Marine Storekeeper and Naval Paymaster, for any farther information you may want. I send this package by him. Mr. Babb, late a Member of the Board of Trade here, can also give you much information.

I am, dear Sir,

Your most obedient servant,

W. ROXBURGH.

Calcutta, Feb. 27, 1801.

ROBERT WISSETT, Esq.

Observations

Observations on the Culture, Properties, and comparative Strength of HEMP, SUN, JUTE, *and other* VEGETABLE FIBRES, *the Growth of* INDIA, *communicated by Dr.* ROXBURGH.

HEMP, considered merely as an article of trade, is an object of the first importance to the merchant; but, when we reflect on its various uses, and observe that hardly any art can be carried on without its assistance, or of some other substitute; the objects it embraces are immense, and there are few that better deserve the attention of the philosopher or intelligent artist. Cordage makes the very sinews and muscles of a ship, and every improvement which can be made in its preparation, either in respect to strength, pliableness, or durability, or in bringing to light substitutes equally good, or better, particularly where hemp itself cannot well be had, must be of immense service, particularly

larly to the mariner, and to the commerce and the defence of nations.

The cultivation of this important plant in our Colonies has not only, at all times, met with encouragement from the Government, but also of late from the East-India Company in Bengal, where extensive experiments were begun by the late Mr. Sinclair, and after his death carried on by Thomas Douglas, on the culture of hemp and flax, on account of the Hon. Company. A clear and impartial statement of these trials is to be wished for, as it will, no doubt, throw much light on the cultivation of hemp in India, and enable us to proceed with greater prospects of success than ever.

My own experiments and inquiries on the same subject, both on the coast of Coromandel and Bengal, have been many, though not extensive. Their result leads me to think, that hemp may be cultivated to great advantage over the interior parts of Bengal and Behar, where the seed

should be sown about the beginning of the periodical rains, or earlier, if there have been frequent showers, on elevated spots of rich loamy soil, such as the Ryots cultivate tobacco, sun, and paat on, near their habitations. In situations of this nature it thrives well, and will be easily attended to. At first, some encouragement will certainly be necessary, to induce the Ryots to undertake this new branch of agriculture. For, although the plant is perfectly familiar to every Hindoo, yet the cultivation on an extensive scale, for the fibres of its bark, is perfectly unknown to them. I would therefore suggest, that they should pay no rent for the ground so occupied for a certain period; that seed should be given gratis; that they should be ensured a certain price for the hemp; and finally, a reward or premium to the person or persons who produced the greatest quantity of the best hemp within a stated period.

In

In many parts of Bengal, particularly where the land is so low as to remain humid through the dry-weather season, hemp thrives luxuriantly during the cold season; but the water is then too cold for macerating the plants to the greatest advantage: one day in June, July, or August, has more effect in loosening the bark, than eight in December, January, or February; consequently, the prolonged immersion injures the quality of the hemp much. The rainy season is therefore preferable for the cultivation and maceration, even if the plant grew better during the cold, which is by no means the case, particularly on lands elevated above the level of the annual inundation of the low rice-fields. We must therefore content ourselves with one crop in the year; for it is a very false notion, and a very prevailing one, that the fertile fields of Asia produce at least two crops annually; as well might we say, that the fertile lands

of England yield at least two, because a well-managed garden, near London, or some other large city, will produce repeated crops in the year: so in India, by great care and industry, a spot here and there will produce two or more crops. The burning heats of Asia, while they last, are as unfavourable for vegetation, as the frosts of winter in Europe.

Besides hemp and flax, the vegetable kingdom, particularly that natural division called by Linnæus, Columniferæ, abounds in plants which produce materials fit for cloths, paper, and cordage: almost every nation or country possesses something of the kind peculiar to itself. To ascertain what these are, as well as to find out new ones, to try their comparative strength, durability, texture, &c. has, at various leisure hours, employed my attention for many years past. Drawings and descriptions of many of them have been already laid before

before the Honourable the Court of Directors. There are, however, some others which remain to be brought under view and compared with the kinds we are best acquainted with, which I have attempted in the following experiments. Many other sorts are also mentioned by various authors and travellers, of which I know nothing more than the names. Two of these are mentioned by Marsden, at pages 75 and 76 of his History of Sumatra. Others are peculiar to Pegu, &c. &c. These I must omit for the present, and confine myself to such as I am more intimately acquainted with. The better to enable me to proceed in this inquiry, I have cultivated, in the Botanic Garden at Calcutta, many of the plants themselves which produce the materials hereafter mentioned; prepared their fibres in general by maceration, &c. as with hemp and flax in Europe. And, to compare their strength (plain, tanned,

and tarred), had them made into cords, composed of three simple yarns, as nearly of the same size and hardness as a Hindoo rope-maker could make them; but, in spite of my utmost care, they were always too hard twisted to be of the greatest possible strength*. Of each sort there were six, when there was a sufficient quantity of the fibres. Three of them were about the size of a log-line, and three a size larger than a whip-cord; one of each size and sort

* The experiments of Reaumur, Sir Chas. Knowles, and Du Hamel, uniformly prove, that when hemp-rope is twisted to the usual hardness, which is that which brings them to two thirds of the length of their respective yarns, their strength is lessened by nearly one fourth, when compared with ropes consisting of the same number of the same yarns twisted up to only three fourths of their length. There will be no difficulty in accounting for this difference, if we consider that a skein of fibres may be twisted so very hard, as to break with any attempt to twist it harder. In this state the fibres are already strained to the utmost, and cannot support any weight or additional strain.

was

was kept white: the average number of pounds which broke them, (for repeated trials were made, and always with lengths of exactly four feet), will be found in the first and second columns on the right. One of each was tanned* with the astringent fruit called *gaub* by the Bengalese, (Embryopteres Glutinifera, Roxb. Coromandel Plants, Vol. I. No. 70.) Their strength is represented in the third and fourth columns of the following table. And, lastly, one of each sort was tarred: their respective strengths will be found in the fifth and sixth columns.

* The idea of tanning cordage is far from being new; for the fishermen of Asia, as well as of Europe, not only tan their nets and lines, but also their sails, to give them additional strength and durability. The same process might be productive of the same effects, if employed on cordage made of the materials (No. 2, 5, 6, 7, 8, and 15), specified in these experiments, which induced me to recommend its being tried with sun cordage, in my letter to the Board of Trade, in August, 1797.

We know the tanning principle strengthens the fibres of leather, (animal fibres); but are not so clear that its operation on vegetable matter is uniformly the same. The attention bestowed to ascertain this point in these experiments will, at least, throw some light on the subject; and may induce others, better qualified, to extend the inquiry (here in India), where tanning materials abound.

Another point of the utmost importance to be ascertained is whether tanned ropes will be preserved by the tan, with which they are impregnated, when stowed away wet; as tarred ropes are preserved by the tar when so circumstanced. It is nevertheless a well-known fact, that tarred cordage, when new, is weaker than white; and that the difference increases by keeping. Tar can therefore only be employed to preserve cordage, and not to strengthen it; so that if tan will add strength, or

even

even not weaken vegetable fibres, and at the same time preserve them; of how great advantage to the nation would the discovery of a convenient practicable process be. For all cordage, exposed to be alternately very wet or dry, requires to be impregnated with a preservative. And, to conclude this long note, I beg leave to observe, that tar is not the produce of the warmer parts of Asia. Are we, therefore, to conclude, that no material, the produce of these parts, can be applied for the same end? Let us not entertain any such idea. Nature is abundantly kind, and furnishes every country and climate with what is most proper for the use of its inhabitants.

(See the Comparative Statement, inserted after the next page.)

The

The annexed statement of the experiments made on the substances there specified, can only be deemed an attempt towards ascertaining their relative strength; and though they are the average result of several trials made on the strength of each cord, plain, tanned, and tarred, yet I must acknowledge they cannot be deemed any thing more than a first essay, chiefly owing to the lines being in general ill laid, some more and some less twisted, and by no means to be compared with those of Europe. For in some instances, I found a small one sustain a greater weight than a much larger, made exactly of the same materials. It is therefore my intention to repeat them on a larger scale, and, if possible, with better made lines; for every thing depends on their being exactly of the same size and degree of twist.

The cords, when the trials were made, had been kept about six months after they

COMPARATIVE STATEMENT of the EXPERIMENTS made by Dr. ROXBURGH, of CALCUTTA, referred to in the adjoining COMMUNICATION.

NAMES of the PLANTS, and brief REMARKS on the various MATERIALS employed in these EXPERIMENTSS.	Average weight at which each sort of cord broke.					
	White.		Tanned.		Tarred.	
	Large	Small	Large	Small	Large	Small
No. 1. English Hemp: a piece of new tiller-rope, opened out and made into cords, like the rest	105	65	..	..	..	..
2. Hemp (Cannabis), the growth of this season, from the Company's Hemp Farm, near Calcutta	74	50	139	60	45	46
3. Coir: the fibres of the husk of the Cocoa-nut; much used for cables and cordage over Asia	87	60	..	..	..	..
4. Ejoo (Saguerus Rumphii): the black horse-hair-like fibres, which grow round the trunk of this species of Sago Palm	96	79	..	..	..	..
5. Robinia Cannabina, Dansha of the Bengalese: the fibres of its bark, prepared by maceration from the plants that had nearly ripened their seed, they are then of a dusky grey colour, and harsh nature	88	64	101	55	84	39
6. The fibres of the bark of No. 5, prepared by maceration, from plants coming into blossom; at which time they are beautifully white, soft, and glossy	46	20	61	35	48	30
*7. Crotolaria Juncea, Sun of the Bengalese: the fibres of its bark, and universally known over India	68	47	69	55	60	37
8. Corchorus Olitorius, Bunghi-paat of the Bengalese: the fibres of its bark, called Jute by the same people	68	47	69	59	61	36
9. Corchorus Capsularis, Ghee-nalta-paat of the Bengalese: the fibres of its bark they call Nalta Jute	67	47	..	..	..	..
10. Flax (Linum Usitatissimum): the growth of the Company's Hemp Farm, near Calcutta	39	37	..	..	..	..
11. Agava Americana: the fibres of its leaves. They are of a coarse harsh nature, and white	110	71	79	78	78	38
12. Aletres Nervosus—In Sanscrit, Murva; Murga of the Bengalese: the fibres of its leaves made into these cords, after having been kept above one year	120	52	73	42	48	43
13. Theobroma Augusta, Linn.—Abroma Augusta, Hort. Kew.—Abroma Wheelerii, Kæn.—Woollet-comal of the Bengalese: the fibres of its bark prepared by maceration, &c. like hemp	74	61	58	51	44	29
14. Theobroma Guazuma, Bastard Cedar: the fibres of the bark of some straight, luxuriant, young plants	52	48	..	47	45	30
15. Hibiscus Tiliaceus, Bola of the Bengalese: the fibres of its bark, and employed for cordage by the inhabitants of the South-Sea Islands, &c.	41	..	62	39	61	..
16. Hibiscus Manihot, a tall white-flowered variety: the fibres of its bark, which are beautifully white, glossy, and soft	61	..	..	..	..	..
17. Hibiscus Mutabilis: the fibres of its bark, and they are of a harsh nature and ill coloured	..	45	53	46	..	..
18. Hibiscus, a new species, from the Cape of Good Hope, said to be a native of Caffraria, where the fibres of its bark are spun	..	22	..	..	..	..
19. Bauhinia, a large scandent species: the fibres of its bark, cleaned without maceration, and used to make ropes, &c. of by the people of Napaul, where the plant is common	69	39	..	..	..	..
20. The same as No. 19, only maceration was used to help to take the bark off the twigs with more care	56	41	..	..	..	..
21. Sterculia Villosa: the fibres of its bark. Cords are made of them by the natives of the Eastern frontier of Bengal, to bind wild Elephants, when first taken	53	..	..	..	..	..

* A cord, a very little thicker than a log-line, made of sun sail twine, broke with 148 pounds when dry; but, on being soaked in cold water for 24 hours, it bore, while wet, 222 pounds. This difference requires to be farther inquired into.

they were prepared, chiefly with the view of allowing the effects of the tan and tar to take place. The result of these experiments show, that tan has in general added strength, while tar has had a contrary effect; and in no instance is this more clearly evinced, than in the common hemp (Cannabis) cultivated in Bengal.

To Ejoo and Coir, neither tan nor tar seem applicable; and in several of the other experiments, I had not a sufficient quantity of the materials to make the necessary number of cords, viz. six of each sort, to try with tan and tar, as well as in their natural state. At some future period, I hope to be more fortunate in procuring larger supplies of the materials, and also to add some other sorts, such as the—

Rajemahl bow-string fibre, the produce of a new species of Asclepias, discovered by William Roxburgh, junior, amongst the Rajemahl Hills;

New

New Zealand Hemp;

Hibiscus Cannabinus, and some other of the same natural order (Columniferæ); (for in general their barks abound with strong fibres; witness the foregoing table, where six of them are to be found);

The leaves of a new species of Andropogon, &c. &c.

APPENDIX,

Containing remarks on some of the Plants mentioned in the foregoing Table.

No. 2. Hemp, or Cannabis Sativa.—Banga, in Sanscrit; Bunga, Bungh, or Bung, of the Hindoos; Bang, of the Persians; Kinnub, of the Arabians, is no doubt our own famous plant, now so common and useful in Europe. I have at different times examined various figures and descriptions, as well as the plants reared from Europe seed, comparing

comparing them with our Indian plant through its various stages, and can discover no difference whatever, not even to found a variety on. Perhaps few vegetables, so widely diffused over almost every part of the known world, and under the immediate management of man, have undergone less change. It is perfectly familiar to all the nations of India, I may say of all the warmer parts of Asia; yet I cannot discover that the fibres of the bark have ever been employed for any purpose. It is cultivated in small quantities every where, on account of its narcotic qualities.—The leaves of the male plant, and flowers of the female, are the parts in most general use.

I have repeatedly applied for the seeds of all plants reared in China, and other countries to the Eastward of the Bay of Bengal, as well as to almost every other part of India we have any communication with, for an account of the

the plants employed to supply materials for clothes and cordage, and for their seeds; but could never learn that Cannabis was one of them; nor were its seeds ever sent to me as such.

No. 4. The great strength of this substance makes it a very desirable object. For a description and drawing of the tree, I refer to those* which accompanied my letter to the Most Noble the Governor-General in Council, under date the 2d of January, 1800. The fibres employed in these experiments were taken from trees growing in the Botanic Garden at Calcutta, where they thrive well. I could observe, during the trials made in breaking the cords of this substance, that they were not so elastic as those of Coir, which will pro-

* A former set, No. 1179, sent in to Government on the 23d of November, 1797, were not so correct as could be wished, on account of their having been taken from young trees, just coming into blossom the first time.

bably

bably render it less fit for cables, but better for many other uses. Coir is certainly the very best material yet known for cables, on account of its great *elasticity* and strength.

Nos. 5, 6, 7, 8, and 9. These four plants have already been figured and described by me, in a memoir sent through the Governor-General in Council, to the Hon. the Court of Directors, in December, 1795. Since writing that paper, I have learned, that *sun* (Crotolaria Juncea) is almost universally employed, over the warmer parts of Asia, for cordage. On the Malabar coast, I find it is generally named by the gentlemen at Bombay after the province where reared. It is used in that place for lacing their cotton bales, on account of its great strength. Samples of three sorts, viz. Malwan, Rajapore, and Salsette, were sent to me, from them, by Dr. William Hunter; and am induced to think, little or no maceration is employed

ployed in taking the bark from the stalks, or in cleaning the fibres, which may add to its strength: for certainly maceration, particularly if long continued, must weaken fresh vegetable fibres considerably. The same gentleman sent me seeds of the Salsette sort: they have produced plants now in blossom, and from them have ascertained the identity of this species.

In some parts of Bengal, a most luxuriant variety is cultivated immediately after the rains, which often grows to the height of twelve or fourteen feet; while the common sort is generally reared in Bengal during the early part of the wet season, and grows to only about half the height of the former.

I must farther observe, that the fibres of No. 5 possess great strength, and it seems to me to be one of the most fit of any of our Indian productions for cables and cordage. The plant grows generally to the height of from six to ten feet,

feet, the fibres long, but harsher than those of hemp, if not cut at an early period. It is very generally cultivated about Calcutta during the rains. An acre yields of the half-cleaned substance (the state in which the natives carry it to market), about 600 lbs. weight, and sells for about a rupee and a quarter per maund of 80 lbs.

No. 6. By cutting No. 5, the last-mentioned plant, when beginning to blossom, we have the most beautiful shining white fibres that can well be conceived, but (by my experiments) greatly weaker than when the seed is suffered to be nearly ripe before the plants are cut.

No. 10. Flax, the plant, is very generally cultivated during the cold season, over the interior parts of Bengal and Behar, merely for the seeds, from which oil is obtained. The flax itself the Hindoos set no value on; for, after they have gathered the seed, they throw

away the stalks as useless, having no knowledge of the fibres which their bark yields. Samples of the flax have repeatedly been procured by the Board of Trade, and sent to England to the Hon. Court of Directors; so that it is from England we may expect to learn its properties. If the flax has been found good, large quantities may be reared at a small expense; as the seed alone, which the crop yields, must be more than equal to the charges, to render it profitable to the farmer.

No. 11. This Agava is of slow growth; on that account I doubt if ever it can be advantageously cultivated; but, where found wild in plenty, it may be manufactured at a trifling expense. Its great strength renders it an object worthy of attention. The fibres are coarse, consequently rope made of them harsh to the feel.

No. 12. Drawings, and a description of the plant Aletris Nervosus Roxb. the

method

method of extracting the fibres, with a quantity of the substance itself, were sent to the Hon. the Court of Directors, through the Madras Government, above ten years past. I also gave a large quantity to Mr. Bebb, when he left Bengal in January, 1800, to take to England with him for trial there. The plant grows fully as well, and is as common as on the Coromandel coast. There has lately been about a biggah (third of an acre) planted out with it in the Botanic Garden, the better to determine the expense, and the annual produce of any given quantity of ground.

No. 13. This plant, a native of various parts of India, New South Wales, Philippine Islands, &c. has been long known to Botanists; yet I cannot, with all the attention that I have been able to bestow on the subject, find that the fibres, so abundantly interwoven through its bark, have ever been used or even

taken notice of by any other person ; so that I think we may look upon it as a new discovery, deserving of more than common attention, on account of the beauty, fineness, and strength of these fibres.

It is perennial, grows luxuriantly in the Botanic Garden, and has been cut down twice within these six or seven months ; so that I think it will, at least, annually afford two or three crops of shoots fit for yielding this substance. My experience does not yet enable me to state how much may be the yearly produce of an acre, but can venture to prognosticate as large a produce as can be obtained from an acre of Dancha, Jute, Sun, Hemp, or Flax.

To render this bark separable from the half-ligneous shoots it covers, to soften its external lamina, or epidermes, and the parenchymatous substance which firmly connects the fibres in their natural state, maceration in stagnant water

for

for from four to eight days, during the warmer parts of the year, answers well whilst three times as many days are scarce sufficient during the cold season; indeed, the process is scarcely practicable then; besides, the fibres are greatly weakened by the length of the maceration.

Immediately on being taken out of the water, and while wet, the shoots are singly taken in the hand, rubbed with some coarse materials, such as a little dry grass or gunny, to remove the exterior pulpy lamina or epidermis of the bark, which is destitute of fibres. This part of the process is easily effected; and when done, the clean shoots are to be made up into small bundles, and placed under weights, or some other equal pressure, to keep them firm at the middle and top, either under the surface of the waters, or out of it; the fibrous bark is then separated with the fingers from a small portion at the end of the ligneous shoot or stalk, which the ope-

rator takes hold of, and draws out one by one; when these are removed, the pulp, or parenchyma, which fills the interstices between the fibres, and connects them together, forming in the living plant that part of the bark which may be called its inner lamina, or cellular tissue, is immediately washed out in cold water, and the clean fibres spread out in the sun to dry. Such was the simple process by which this substance (which may very properly be called Indian Hemp or Flax) was prepared.

I have now under cultivation about the third of an acre (a biggah) of ground in the Botanic Garden with this plant; the result shall be carefully noted from time to time. It might have been prudent to have withheld this account until that time; but the strong desire of making known a discovery, which may in a short time become beneficial to the public, induces me to be thus precipitate.

For

For a farther account of this plant, I beg leave to refer to my drawing and description thereof, sent to the Hon. the Court of Directors some years ago, and numbered 415.

W. ROXBURGH.

Botanic Garden, near Calcutta,
Jan. 31, 1801.

Additional Experiments on the STRENGTH *of* SUN *(No. VII.)*

Some tanned sail-twine, made of this substance four years ago, for the inspection of the Marine Board, was made into a cord of three strands; each of the strands composed of four threads of the sail-twine.

Some more of the same sail-twine, tanned twelve months ago, was made into a similar cord, and another was made of the white unprepared twine.

The first, which had been tanned four years, broke with 110 lbs. when dry,

and with 130 lbs. after having been steeped in water 24 hours.

The second, which had been tanned one year, broke with 123 lbs. when dry, and with 140 lbs. after steeping 24 hours.

The third, or plain white, broke with 148 lbs. when dry, and with 222 lbs. after steeping 24 hours.

The

The THANKS of the Society were, this Session, voted to Dr. ALEXANDER ANDERSON, of St. Vincent, for the following COMMUNICATION, relative to the ROYAL BOTANICAL GARDEN established in that Island.

SIR,

I AM honoured with yours of the 5th of July last. My long silence was owing to my absence from the Garden, to which I returned from Trinidad in the end of June.

I have the pleasure of informing you, that the wished-for addition of land to the Garden has been obtained, and a valuable acquisition it is, the whole being good soil, and a great part level; at least, so much so, that, with the precautions I have taken, it cannot be injured by washes from torrents of rain, which have totally destroyed

destroyed the old Garden. The new part I reserve for the more valuable plants, as I proceed to procure them. For the enlargement, the Garden is much indebted to the exertions of the Society of Arts, and those of General Melville.

The two Nutmeg Trees are thriving luxuriantly: my sincere wish is, that they may be male and female. I think it rather strange, that plants of them, as well as of other useful productions of the East, have not been, before now, sent to these Colonies. Except the two Nutmeg Plants here, I believe there is not another individual in any of the British Islands on this side of the Atlantic. To the French we are indebted for all the most valuable of the East-India plants we at present possess.

On this side the water, Lord Seaforth is the only man at present who is using any exertion for the introduction of new and useful productions, or promotion of science: for these objects he

spares

spares no expense or labour. He sent a gentleman to Cayenne, in hopes to procure some of their valuable plants, but in vain; for Victor Hugues was not so generous to him as to me; all the liberty he got, was permission to pick indigenous plants. Lord Seaforth intends to make application to the King, to send a ship to the East Indies with the sole intention to bring plants and seeds directly to this Garden. I hope he will succeed.

If it is in my power to forward any thing from hence, that may be acceptable to the Society, I will regard myself honoured in their commands. Any plants or seeds from England, which you can furnish, that are likely to prove useful in food, commerce, medicine, or economy, will be a great acquisition to this Garden. Merely as a sample for the Society, I have transmitted you a few seeds of different plants; also a little Terra Japonica, or inspissated juice

juice of Mimosa Catechu: if the Society think it will prove a substitute for the Eastern, or if the article is of value at present, pray inform me, as I can make any quantity of it, having plenty of the trees. The only process I used was, to boil pieces of the wood and bark together in a common earthen pot; therefore it may perhaps not be equal in taste and colour to that of the East Indies.

Some Tea Trees, Pepper, and Mulberry, which I have planted in the new ground, are thriving remarkably well, as is the Manna Ash. The Mulberry I fancy to be of little value: if it is, let me know, that I may increase it.

I am ever, with great regard,

SIR,

Your much obliged

and obedient Servant,

ALEXANDER ANDERSON.

Botanical Garden, St. Vincent,
Nov. 18, 1803.

CHAS. TAYLOR, Esq.

*** The

*** The articles mentioned in the above letter, and which are noticed by Dr. Anderson to have been forwarded to the Society in a small parcel, by John Thos. Rayner, Esq. have not yet been delivered to them.—If retained by any person, from a mistake in the address, they are requested to be sent to the Society's House in the Adelphi, addressed to the Secretary.

December, 1804.

The SILVER MEDAL of the Society was this Session voted to Mr. WALTER BAINE, of Greenock, as a Bounty for his Experiments and Endeavours, made during the last Session, to improve the method of CURING WHITE HERRINGS, taken on the coast of North Britain, and as an encouragement to induce him to make farther trials.

THE Herrings sent from him to the Society were superior in quality to those usually prepared on the coast of Scotland, but not equal to the Dutch Herrings. It appears from the account given by Mr. Baine, that the Dutch method of treatment of the Herrings, from the time they are caught until they are landed, is known in North Britain; but that the knowledge of their treatment from the time

time they are brought from the Fishery until they are sent to market, is more uncertain, and that Dutch Curers should therefore be procured to complete an object of such great national importance.

The Society, anxious to furnish useful information relative to the Herring Fisheries, have annexed a Translation, with which they have been favoured by J. Hinckley, Esq. F.S.A. one of their Members, from a valuable Treatise on this subject in the German language.

The DUTCH METHOD *of* CURING HERRINGS, *extracted and translated from the German of Krünitz's Economical Encyclopædia* (Oeconomische Encyclopädie), *article Häring, by* J. HINCKLEY, *Esq. F.S.A.*

The vessels employed in this fishery, commonly called herring-busses, from the

the Dutch name, are generally between 48 and 60 tons burthen, though some from 40 to 80 and 100 tons are used. The largest of all carry 120 tons, are three-masted vessels, with one deck, and a cabin at each end; that a-head serving as a kitchen. Of the larger, the crews are 24 men, those of the smaller 18. They carry a few small guns and musquetry.

Their nets are dipped, or cast out, in the evening, and drawn up in the morning. It requires three hours to wind them on board. From the net, the fish are immediately put into baskets, while others of the crew are occupied till evening in gutting, salting, and packing. But although from ten to fifteen last are sometimes taken at a draught, the twelve persons usually employed for the purpose, cannot complete more than five last in a day.

During the three first weeks, from the 25th of June to the 16th of July, all the fresh-

caught herrings are thrown into casks without picking, and conveyed to Holland, in the jägers, or yachts,* that accompany the herring-busses. But, after this period, immediately on being got on board, and gutted, they are assorted into three qualities,—maiden herrings, full herrings, and shot herrings. The first of these are those taken earliest, and without roe or milt, but which, though well flavoured, do not keep. Full herrings are those taken at Midsummer, on the point of spawning; from which the brand-herrings, so called from the barrels being marked with a hot iron, only differ in being caught later, re-packed immediately on arrival, and so close and hard pressed down,

* These are small fast-sailing vessels, which follow the herring-busses, supply them with provisions, casks, salt, and other necessaries, and carry the fish that have been taken to the nearest port, where they are re-packed, and prepared for sending to the places of their destination.

that they do not require re-packing at other places, but only new pickle; and are immediately expedited, or may remain on hand: whereas the other two sorts, not being so closely laid, must absolutely be re-packed. Shot-herrings are those which have spawned, or are taken in the act of spawning, in consequence of which they are thin and lean.

With the last two sorts the busses themselves return (as soon as they have got their loading, or find no more fish), one after another, to port, where all three sorts, except the brand-herrings, before being expedited, are opened, salted anew, re-packed, and so heaped up, that fourteen casks are re-packed in twelve, which make a last. By a regulation of the States-General, this re-packing must be performed in the open air, where strict watch is kept, that the spoiling fish be carefully separated from the good, and the latter properly laid

in

in the barrels, and strongly pressed down.

The Dutch fishery continues generally from twenty to twenty-six weeks, or even somewhat longer, namely, from the 25th of June to the middle of January. The Dutch fish only on the Scotch and English coasts, off Hittland, Fairhill, and Bocken, from Midsummer, till the 25th of July; off Bocken or Serenial, from thence till the 14th of September; and in deep water, East of Yarmouth, and as far as the mouth of the Thames, from thence to the 25th of November, when the regular fishery ceases. But herrings are found not far from Yarmouth till the end of January, after which the fishery is prohibited, as the spawning season then commences.

Herrings, however, are equally good, wherever they are taken, provided they be but caught in the proper season, and well managed. As they die immedi-

ately on quitting their element, salting and packing are the circumstances which principally affect their quality. The superior excellence and flavour of Dutch herrings, above those of all other countries, arises from the close attention and indefatigable industry employed. Every thing, however minute, both as to season and management, which can maintain the reputation they have enjoyed for more than two hundred years, is most punctually observed; and above thirty ordinances on the curing and management of herrings are recited by Sir William Temple, in the 17th century.

Herrings, cured with Scotch salt, very quickly decay. Those of Norway are cured in the same manner as the Scotch, but with French salt, and packed in fir or deal; in consequence of which they are worse, and less palatable, as they leave a sour taste in the mouth, and soon spoil. In like manner,

other

other nations are equally careless in assorting the fish, and to this may be attributed the precedency which the Dutch herrings have so long maintained. The Dutch catch their fish regularly and early off Hittland, from the 25th of June, because they are then, and to the beginning of July, fattest; after which time, the nearer they approach the coast, the leaner and worse they are.

It redounds no less to the honour of the Dutch, than to their advantage, that they pay the utmost possible attention to these rules: according to which, the fish must be taken at the proper season, properly salted, well assorted, and rightly packed; to do all which, the captain and sailors are by several laws obliged to bind themselves by oath, before they sail. There are also overseers well paid, that they may not betray their trust, but watch and enforce every the minutest regulation; to which circumstance also, the pre-eminence of

Dutch herrings throughout the world may partly be ascribed.

As soon as the herrings are taken out of the water, they are thrown either upon the end of the deck, which has been cleared, and made perfectly clean for the purpose, or into baskets; and then *gipped* (the gills and guts taken out) with a knife, by some of the crew, who are solely employed therein, having been brought up to that practice. The milt, or roe, however, is always left in the fish.* What are taken during one night, are, before the following sun-set, neatly and skilfully laid in oaken barrels, coarse Spanish or Portuguese bay salt being strewed between. This the fishermen of other countries either entirely neglect, or less carefully perform, being less scrupulously nice; because they either go out to sea later, or,

* Mr. M'Culloch's Treatise (see note, page 413) says, they should also be kept cleanly, and out of the sun, as well as frost or rain.

like

like the Scotch, commence fishing too soon; or only navigate small boats near the coast; do not kill the fish with a knife, or gut, salt, or pack them, while on board, but throw them down in a boat, and when fully laden, go on shore, proceed at their leisure, cast the fish on the sea-coast in considerable heaps, where they are even suffered to lie sometimes several days, before they are gutted, salted, and packed, in consequence of which they grow stale and ferment. The Dutch, on the contrary, indefatigably pursue their method day and night, during twenty, twenty-four, or twenty-six weeks, be the weather what it may. Hence, their fish are usually more tender, better flavoured, and not so very salt as the English and the Scotch.

There are two methods of salting and preserving herrings for a considerable length of time. The one is called white salting, the other red. The former is

thus performed. Immediately on being taken, the fish are gutted, as above described, and washed in clean water. Then salt is sprinkled on them, either internally, or both within and without, and the fish, being thrown into large baskets with handles, are well roused, (or shaken about a few times) that the salt may the better diffuse itself, and penetrate: or, lastly, which is the best method, they are thrown into a tub filled with a strong brine made with bay salt and fresh water, in which an egg will swim. In this pickle they are left upon deck in the open air, provided the weather be good, during twelve or fifteen hours; but, if circumstances require, a good deal longer, and are well stirred (especially if pickled on shore) with shovels several times, that the salt may the better and more generally penetrate every where. Lastly, to pack them properly, they are taken out of the pickle, suffered to drain sufficiently,

ciently, and then packed in barrels, which are strewed at bottom pretty thickly with salt, and, if there is time enough, they are neatly laid in strata or layers, always strewing sufficient salt upon each layer. But, if the abundance of fish be too great, they are thrown in promiscuously, with as much salt as is requisite to preserve them from spoiling. When this is done in strata, each new layer is pressed down hard upon the preceding. This last-mentioned process, however, cannot easily be attended to at sea, especially when the fishery is very abundant. Hence, if the fish are to be exported, or remain long unused, they are re-packed on shore, laid in fresh salt, and pressed down hard; without which precaution herrings exported by sea would spoil. The same practice is pursued in France, Hamburgh, and doubtless elsewhere. At Hamburgh, as in Holland, they are packed in the open air, ten packers and three overseers being

being appointed for the purpose, and all sworn. Besides re-packing, the packers in the maritime towns have also to pick and assort the fish, according to their goodness, salt them anew, and put them in fresh pickle. It is also generally a part of the magistrates and trading companies oaths, not to suffer any bad fish to be delivered from the quay or custom-house.

After packing, whether the goods are intended for exportation or home-consumption, whether pressed down hard or not, they are regularly coopered, that the pickle may not leek out, and the fish turn yellow or spoil, which takes place the moment they are deficient in pickle. Properly, the herrings should, on the very day on which they are taken, not only be gutted, but salted and put in casks, or at least should not lie more than one night in the first pickle. And accordingly such herrings are distinguished in France by the name

of

of *Harengs d'une nuit*. But, when the fishery is abundant, this is not always possible; so that only a part can be properly attended to; and the rest, after being gutted, must unavoidably remain, at least the whole following day, if not longer, in the first pickle, the regular packing of them being postponed till the third day. These fish, having stood two nights on deck in the open air, are called *Harengs de deux nuits*. But such goods not only are inferior, but do not keep so well as the former.

If the fishermen mean again to cast their nets on the following night, or if, on account of the great abundance of the shoals, they do not expect to complete the salting and regular packing in two days, the fish, which they cannot so complete, are salted in large heaps, and are then called *Slabbers*, or *Slabbegut*, coarse goods. These are frequently too salt, because want of time prevents

prevents their being properly managed. They are put into the schuyts, which always accompany the herring-busses, and washed; after which they are smoked; though not so much as the *Bicklings* (Bücklinge) or red-herrings. The salted herrings, hitherto spoken of, are called *Böckel herringe*, or pickled herrings, or, in general, plainly *Herrings;* those properly salted and packed in layers, *Packed*, or *Barrel herrings;* and those half-salted, and promiscuously packed in barrels, *Wrack herrings*.

The other mode of curing, called Red-salting, is thus performed. When the fish are taken out of the above-described pickle, in which, however, they must remain longer than those intended for the common, or white-salting, and at least four-and-twenty hours; they are hung by the head in rows on wooden poles, in stoves constructed for the purpose, each of which generally contains 12,000 herrings. Being thus placed, a fire

fire is made under them with vine-stalks, or any green faggot-wood, that affords much smoke and little flame.* Here they remain till dried, and properly smoked, which generally requires twenty-four hours. Thus they become Bicklings, or Red-herrings; when these are packed in barrels, they are called Barrelled Bicklings, and are much salted; but, if laid in straw, they are called Straw Bicklings, and are somewhat less salted. The excellence of the Bicklings principally consists in their being large, fat, tender, fresh, properly salted, pliable, soft, of the colour of gold, and not torn or mangled. In Holland, the best fish are chosen for this purpose;

* At Bremen, the place most celebrated for smoking fish, and where no secret is made, as in Holland, of the process, they are hung in ovens of the size of a small parlour, and strict attention is paid not to use fir, or any wood, in which is any the least turpentine or resinous matter, which invariably gives a bad taste to the fish.

but in other places, the above-described Slabbers only are used, or other inferior herrings, deemed unfit for the usual mode of salting. The best and fattest smoked Dutch herrings are called, in German, *Speckbucklinge*, or fat red-herrings; in low Saxon, *Flickhäringe*; and in Hamburgh *Fläkheeringe*. They are cut open along the back*.

* The Act of Parliament regulations, and many useful observations, may be seen in two small tracts, 8vo, in possession of the Society for the Encouragement of Arts, Manufactures and Commerce, the one entitled, "Observations on the Herring-fishery, upon the North and East Coasts of Scotland, &c. with plain Rules, proposed for curing, and for supplying the London Market with White Herrings, by Lewis M'Culloch, many years employed in furnishing the merchants of London with herrings for exportation. London. Richardson, 1788;" the other, entitled, "The best and most approved Method of curing White Herrings, and all kinds of white fish, containing particular directions how to slit, gut, salt, dry, and barrel them, fit for sale at home or foreign markets, with directions for boiling of oil, by a Trader in Fish. London. J. Davidson. 1750."

REWARDS

REWARDS

BESTOWED BY THE

SOCIETY,

FROM OCTOBER, 1803,

TO JUNE, 1804.

REWARDS.

Society of Arts,
Manufactures, and Commerce.

ON Wednesday, the 6th of June, 1804, the Society held the last Meeting of that Session, and adjourned to the fourth Wednesday in October following.

On Tuesday, the 29th of May, agreeably to the Resolutions of the Society, the Premiums and Bounties which had been then adjudged during the Session, were delivered to the Claimants, from the Chair, by his Grace the Duke of NORFOLK, the President, in presence of a very numerous assembly of Noblemen, Ladies, and Gentlemen. The business was begun by an appropriate speech from the Secretary, noticing the objects of the Society, from its institution, in the year 1754, to the present time, and particularising the Rewards which had been then adjudged this session.

The Rewards bestowed were arranged under the following Classes.

IN AGRICULTURE.

To J. C. Curwen, Esq. M.P. of Belle-Isle, Winandermere, for planting 814,956 Timber Trees, Class 23, the Gold Medal. See page 23.

To J. A. Borron, Esq. Warrington, for planting 600,000 Osiers, Class 14, the Gold Medal. See page 34.

To Thos. Plowman, Esq. Broome, in Norfolk, for an improved Sheepfold, the Gold Medal. See page 39.

To J. C. Curwen, Esq. M.P. Belle-Isle, Winandermere, for Drains extending 6000 yards, the Gold Medal. See page 47.

To Mr. John Shirreff, Captain Head, for preserving Turnips in Winter, Class 51, Thirty Guineas. See page 118.

To

To Mr. Wm. Watson, North Middleton, near Belford, Northumberland, for the comparative culture of Turnips, the Silver Medal. See page 92.

To John Hutton, Esq. Marske, near Richmond, Yorkshire, for planting nineteen acres with Forest Trees, the Silver Medal. See page 55.

To Mr. Wm. Pearce, Landewednack, near Helston, Cornwall, for unremitted Industry, the Silver Medal and Fifteen Guineas. See page 60.

IN CHEMISTRY.

To Sir H. Englefield, Bart. Tilney-street, for Lake from Madder, the Gold Medal. See page 141.

To Dr. Wm. Dyce, Aberdeen, for a Mine of Manganese, the Gold Medal. See page 162.

To Mr. Matthew Gregson, Liverpool, for useful Applications of burnt Articles, the Gold Medal. See page 185.

To Dr. JAMES HOWISON, for his Essence of Tan, the GOLD MEDAL. See page 201.

To J. MACHLACHLAN, Esq. Calcutta, for Accounts of the Eastern Red Dyes, and Mineral Products, the SILVER MEDAL. See page 206.

IN POLITE ARTS.

To Miss ELIZ. PENMAN, Glasgow, for an Original Painting of a Young Lady, Class 127, the GOLD MEDAL.

To Miss ELIZ. CRUTTWELL, Hammersmith, for a Drawing copied from Bartolozzi's Print of Silence, Class 128, the SILVER MEDAL.

To Miss HARRIET GOUGH, Pontatawee Cottage, near Neath, Glamorganshire, for a Crayon Drawing of the Ambassador of Peace, from an idea in Blacklock's Poems, the SILVER MEDAL.

To Miss GRINDALL, Lower Brook-street, Grosvenor-square, for a Drawing of the Holy Family, copied from an Original

Original of Francesco Vaunis, the SILVER MEDAL.

To Miss SOPHIA CHARLOTTE DAY, Lower Bryanstone-street, Portman-square, for a Black Chalk Drawing of the Virgin and Child, the SILVER MEDAL.

To Miss SPURGEON, Lowestoft, Suffolk, for Copies of two Miniature Paintings, the SILVER MEDAL.

To Miss ANDREE, Hatton-Garden, for an Oil Painting of a Child with Fruit, the SILVER MEDAL.

To JOHN CHURCHMAN, Esq. for Geographical and Topographical Improvement, the SILVER MEDAL. See page 221.

To Miss MATILDA LOWRY, Titchfield-street, for an Original View from Hampstead, Class 131, the GOLD PALLET.

To Mr. GEORGE SHEPHERD, Radcliffe-row, City-road, for an original View of St. Augustine's Gate, in Can-

terbury, Class 132, the greater SILVER PALLET.

To Mr. HENRY CORBOULD, John-street, Fitzroy-square, for an Original Historical Drawing of Mars and Bellona, Class 133, the GOLD PALLET.

To Mr. W. HESELTINE, Bromley, near Bow, for an Original Historical Drawing of the Murder of Lady Macduff and her Children, Class 134, the greater SILVER PALLET.

To Mr. G. JONES, Great Portland-street, for an Original Historical Drawing from Ossian's Poems, the lesser SILVER PALLET.

To Mr. MIDDIMAN, Lower Grafton-street, for a Print engraved by him from Zuccarelli, Class 135, the GOLD MEDAL.

To Mr. HENRY HOLE, near the Botanic Garden, Liverpool, for an Engraving on Wood, Class 146, the GOLD PALLET.

To

To Mr. Rich. Austin, jun. Paul's Alley, Barbican, for a Wood Engraving of Yorick's Monument, Class 147, the greater Silver Pallet.

To Mr. J. Carey, for a Map of Cardiganshire, the Gold Medal.

To Mr. J. S. Halfpenny, Stafford-place, Pimlico, for an Outline of the Apollo Belvidere, Class 129, the greater Silver Pallet.

To Mr. H. D. Thielcke, Stafford-place, Pimlico, for an Outline of the Apollo Belvidere, Class 129, the lesser Silver Pallet.

IN MANUFACTURES.

To Mr. James Birch, Tavistock-Mews, Tavistock-street, Tottenham-court-road, for an improved Swivel Loom, Twenty-five Guineas. See page 233.

To Mr. James Pickard, Skinner-street, Bishopsgate-street, for an im-

proved Engine Loom, TWENTY GUINEAS. See page 238.

IN MECHANICKS.

To the Rev. D. PAPE, Penn, near Wolverhampton, for improving Rye Harbour, the GOLD MEDAL. See page 245.

To Captain BRODIE, Royal Navy, Leith, for Marine Improvements, the GOLD MEDAL. See page 256.

To Mr. R. SEPPINGS, Chatham-yard, for obviating the necessity of lifting Ships, the GOLD MEDAL. See page 275.

To Mr. GEORGE WALBY, Goswell-street, for a hammer for making trowels, the SILVER MEDAL and FORTY GUINEAS. See page 335.

To Mr. GEORGE DODD, of Duke-street, Portland-place, for an improved Gun Lock, the SILVER MEDAL and TEN GUINEAS. See page 293.

To

To Mr. James Rawlinson, Derby, for an improved Colour Mill, the Silver Medal and Ten Guineas. See page 260.

To the Chevalier Edelcrantz, of Sweden, for a Safety Valve for Steam Engines, the Silver Medal. See page 329.

To Mr. Wm. Hardy, Chapel-street, for a method of banking the Balance of a Time-Keeper, Thirty Guineas. See page 311.

To Mr. Thomas Holden, of Petworth, for a Machine to do the Thread-work in Shoe-making standing, Fifteen Guineas. See page 304.

To Mr. J. M. Elliot, Aylesbury-street, for his improved Repeating-Watch, Thirty Guineas. See page 304.

IN COLONIES and TRADE.

To J. W. Clarke, Esq. Montreal, for the Culture of Hemp, the Gold Medal. See page 345.

To

To Mr. Jacob Schneider, York, Upper Canada, for the Culture of Hemp, Class 188, the Gold Medal, or One Hundred Dollars. See page 353.

To Mr. Daniel Mosher, Kingston, Upper Canada, for the Culture of Hemp, Class 189, the Silver Medal, or Eighty Dollars. See page 358.

To Walter Baine, Esq. Greenock, for curing White Herrings, the Silver Medal. See page 402.

PRESENTS

RECEIVED BY THE

SOCIETY,

SINCE THE PUBLICATION OF THE TWENTY-FIRST VOLUME OF THESE TRANSACTIONS.

With the NAMES of the DONORS.

ROYAL SOCIETY.

THE Second Part of the Philosophical Transactions for the year 1802.

SOCIETY OF ANTIQUARIES.

Two Engravings of Antique Plates. The Fourteenth Volume of the Archæologia.

The

The Royal Humane Society.
By Dr. Hawes.

Annual Report of the Humane Society for 1808; and the Anniversary Sermon preached by the Bishop of Gloucester.

The Dublin Society.
By General Valancy.

The Third Volume of the Dublin Society's Transactions.

The Leipsig Society.

Two Numbers of their Transactions.

The Committee of Warehouses of the Hon. East-India Company.
By Robert Wisset, Esq.

An Account of Fishes on the Coast of Coromandel; two Folio Volumes.

His Grace the Duke of Northumberland.

A Sample of Wood from Botany Bay.

Mr.

Mr. Accum.

A Practical Essay on the Analysis of Minerals.

Mr. Ainstie.

A Pamphlet, entitled, Observations on the Importance and Necessity of introducing improved Machinery into the Woollen Manufactory.

James Barry, Esq.

Two Engravings of his Paintings in the Society's Great Room.

Wm. Bridgman, Esq.

Translations from the Greek of Aristotle's Synopsis, &c. Octavo.

Mr. Brown, of Markle.

Nos. 14 and 15 of the Farmer's Magazine.

Messrs.

Messrs. Cadell and Davies.

Four Numbers of the Imperial Review.

John M'Creery.

The Press, a Poem, Quarto.

J. C. Curwen, Esq.

A Model of a Machine for washing Potatoes or Linen.

The Chevalier Edelcrantz.

Traité des Télégraphes. Octavo.
A Statical Lamp.

Valentine Green, Esq.

A Proof Impression of the Portrait of the Earl of Romney.

The Rules, Orders, and Regulations of the Society of Engravers, instituted at London, 1802.

Mr. Joyce Gold.

The Ninth and Tenth Volumes of the Naval Chronicle.

Mr.

Mr. Greathead.

A Pamphlet, entitled, The Report of the Proceedings in Parliament respecting the Life-Boat.

Dr. E. Harrison.

A Pamphlet, entitled, An Inquiry into the Rot in Sheep.

Mr. J. H. L. Hunt.

Juvenilia, or a Collection of Poems, written between the ages of twelve and sixteen. Octavo.

Dr. Hunter.

The Fifth and Sixth Volumes of his Georgical Essays. Octavo.

Wm. Lumley, Esq.

The Mystical Initiations, or Hymns of Orpheus; and Five Books of Plotinus; both translated from the Greek, by Thomas Taylor; and a Dissertation on the Eleusinian and Bacchic Mysteries,

ries, by the same Translator: also, the Poetry of the Anti-Jacobin.

ROBERT MITCHEL, Esq.

An accurate Plan of the Docks for the West-India Trade, and the Canal, in the Isle of Dogs.

THOMAS N. PARKER, Esq. M.A.

An Essay on the Construction, Hanging, and Fastening of Gates.

Mr. PARKER.

An Engraving of the Right Hon. Henry Addington.

Mr. PELLIZER.

A Method of squaring the Circle.

Dr. PERCIVAL, of Manchester.

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A Plan of a Water Meadow, made out of a Bog at Prisley Farm, belonging to his Grace the Duke of Bedford.

Mr. Summerfield.

Two Engravings by him.

Colonel Tatham.

A Basket, containing Manufactures of the Indigent Blind.

Wm. Tooke, Esq.

Churchill's Poetical Works. Two Volumes, Octavo.

John Wyatt, Esq.

The 85th to the 96th Number inclusive of the Repertory of Arts and Manufactures. Also, No. 1 to 24 of the New Series.

A CATA-

A CATALOGUE

OF THE

MODELS AND MACHINES

Received since the Publication of the Twenty-first Volume of the Society's Transactions, with the Numbers as they are arranged in the Classes to which they belong.

AGRICULTURE. CLASS I.

No. XCVII. A MODEL of an improved Sheepfold, by Mr. Thomas Plowman. See page 39.

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ERRATA.

Page 91—For *Curwan* read *Curwen*.

Page 325, line 6—For *steel pullies* E F G H, read *friction rollers* E F and *plates* G H.

Line 11—dele *on the underside*.

Line 12—dele *by the dotted arch*, and read *at*.

Line 16—For *part* read *the pivot*.

Line 17—dele *complete*.